INTERVIEW: AOTC CEO FRANK BLOUNT

STRALIAN communications

BRUARY 1993 The Data and Telecommunications Management Magazine $5.50

NTERNATIONAL COMMUNICATIONS

A survey of options for Australian business

BUYING A WAN

A detailed look at solutions from six vendors

NETWARE 4.0

Novell's new platform for enterprise networking

THE IDA FAILURE

Is our telecommunications industry policy flawed?

ROUTING S

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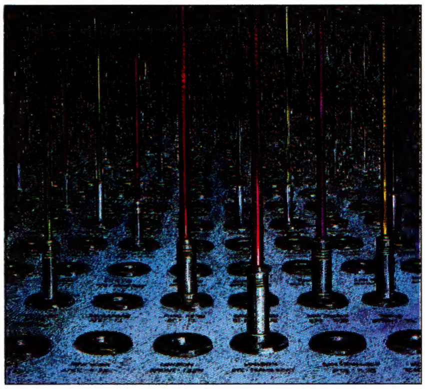

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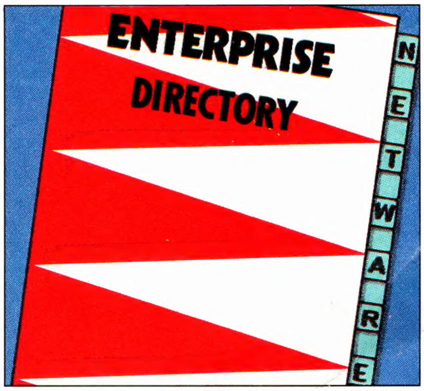

INTERNATIONAL COMMUNICATIONS 61

It only seems like yesterday that Australian Communications Managers could entrust all of their company's international communications requirements to OTC and feel comfortable that — virtually by default — they'd made the best choice possible. But times have changed and thanks to deregulation there is now an ever-growing list of alternative carriers and service providers. A multinational corporation in Australia today can establish overseas communications by utilising services provided via any one or more of at least 16 resident providers. Consultel's George Bakunowicz presents an exhaustive survey of the services now available.

BUYING A WAN 75

In our December/January edition we presented the first installment of a special feature article exploring the various solutions on offer from Australia's leading wide area networking solutions vendors. In it, we presented a summarised view of the responses of nine vendors to a real-life set of wide area networking requirements formulated specifically for the purpose. This month, in Part #2, Brian White examines the solutions in much greater detail and takes a closer look at the functionality provided by each vendor and how they each address common WAN issues. In particular, we zoom in on the network solutions proposed by 3Com, Bull, Com Tech, Interlink, Ungermann-Bass and NetComm.

THE NEW NETWARE 83

It's often the case that when a company grows to dominate a market it tends to rest on its laurels and begins to stagnate. But although this has happened several times in the computer industry, it doesn't look a likely scenario for LAN operating system market leader, Novell. With its new NetWare 4.0, the company is counting on a new directory service to turn a NetWare weakness into a clear advantage. And it's new Burst Mode boosts performance over wide area network links without sacrificing its LAN advantages. But the key to NetWare 4.0 is that it addresses what has so far been one of NetWare's nagging weaknesses — its inability to let administrators manage large networks easily.

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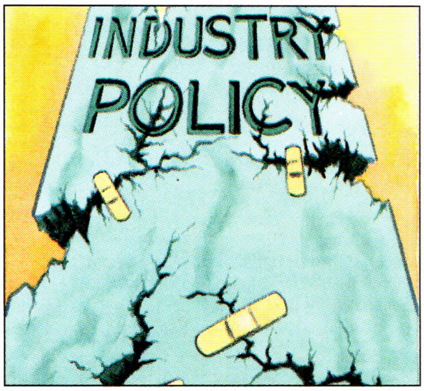

THE IDAs 95

A key element in the Government's industry policy platform, the Industry Development Arrangements have now been extended to 1996. Does that mean that they've been a success? Not according to Dr Terry Cutler. He argues that the Government needs to encourage strategic alliances between telecommunications carriers and manufacturers, rather than manipulate domestic procurement policies. The reality is that successful industry strategies cannot be developed within a domestic, inward looking framework. Success will require the right combination of strategic investment attraction and enterprise incentives. Partial and ad hoc interventions like the IDA scheme are worse than no industry policy at all.

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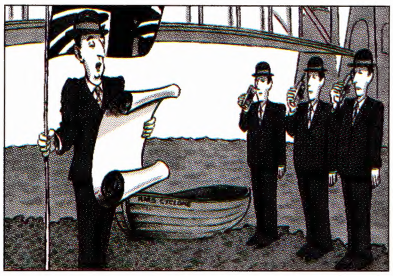

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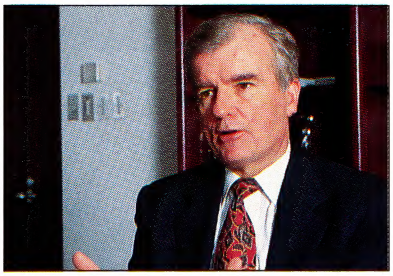
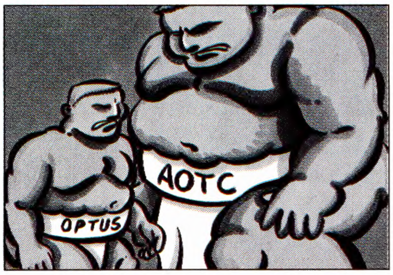
INTERVIEW

51 Frank Blount
Appointed in late 1991 as the first CEO of AOTC, ex-AT&T executive Frank Blount has worked very hard at turning the merged Telecom and OTC into a competitive and customer-focused company. Liz Fell asked him about his progress so far.



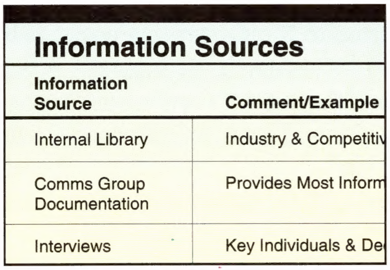
LEGAL LINE

49 Dominance and Telephones
Regulation of the dominant carrier is a central theme of the Australian telecommunications regulatory regime. Peter Waters considers a recently released Bureau of Transport and Communications Economics report on the meaning of dominance.



MANAGEMENT

101 Benchmarking — A Methodology
When properly used, benchmarking can often lead to big improvements in communications management efficiency. This month, Brian White examines benchmarking categories and methodologies. The first step is always to identify the key issues.



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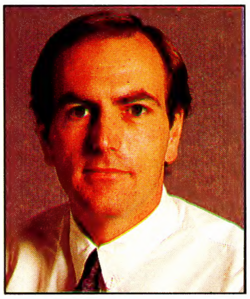
A Timely Job Promise



Congratulations to Arena GSM for winning the right to establish and operate Australia's third mobile telephone network. As well as providing the Government with an appropriate level of financial inducement ($140 million) its bid was comprehensive, believable, professionally managed and deserved of success. Among other things, the 'consortium' (which at the time of the bid really only consisted of the United Kingdom's Vodafone — although the AAP Group has an option to take a future stake) promised expenditure of $400 million on network infrastructure (60% of which will be spent locally) and to provide coverage to 80% of Australia's population by 1996. In addition, Arena has stated that its plans will lead to the creation of 5,000 new jobs over the next few years.

Without denying the importance of Vodafone's technology leadership and track record in securing the licence, it would be interesting to know how much weight was given to the 5,000-job promise in weighing up the respective bids. Arena was not necessarily the highest bidder but it was the only one to publicly place weight on the highly sensitive jobs issue (in fact, early in the bidding process Arena was talking about 5,000-10,000 jobs). And it's Arena's jobs claim which has raised the most cynicism. When bidding for the second network licence in 1991, Optus Communications promised to spend 10 times what Arena proposes but only to create 10,000 direct and indirect jobs — and even that promise was then regarded by some as extravagant. Late last year the new carrier reported to the Government that it had so far directly created less than 1,500 jobs since it commenced operations and provided the catalyst for over 550 extra jobs among secondary industries.

So judged against Optus, the Government's hopes of Arena becoming a private-sector job creation scheme seem a little misplaced. But then again, with record unemployment and an election looming, any headlines proclaiming thousands of new jobs are more than welcome.

MASmeaton

Optus P5 Mobile Phone Competition Winner

Our recent subscription competition which gave new subscribers a chance to win an Optus P5 mobile telephone and Airtime Package valued at over $2,800 certainly kept our fax machine running hot!

Mr Frank Zeichner from Alcatel Australia received an extra Christmas gift when his entry was drawn from the box by Optus' Director of Marketing and Sales, Cleve Whatley (right), who received a helping hand from *Australian Communications'* National Sales Manager, Craig Burkill.

Australian Communications extends its congratulations to Mr Zeichner on winning the competition and thanks to Optus Communications for its support.

AUSTRALIAN
communications

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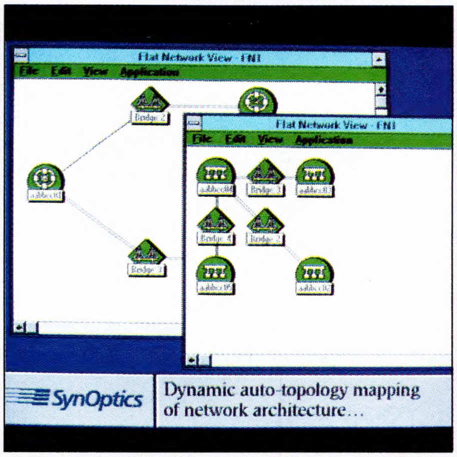

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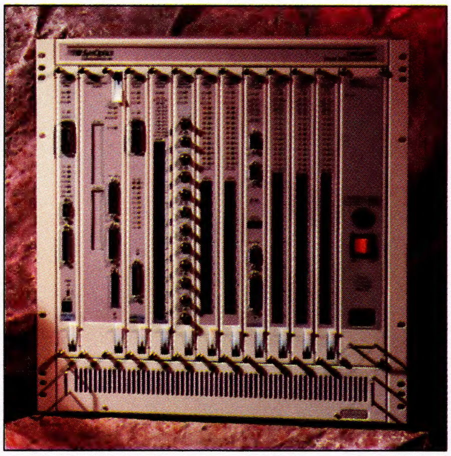

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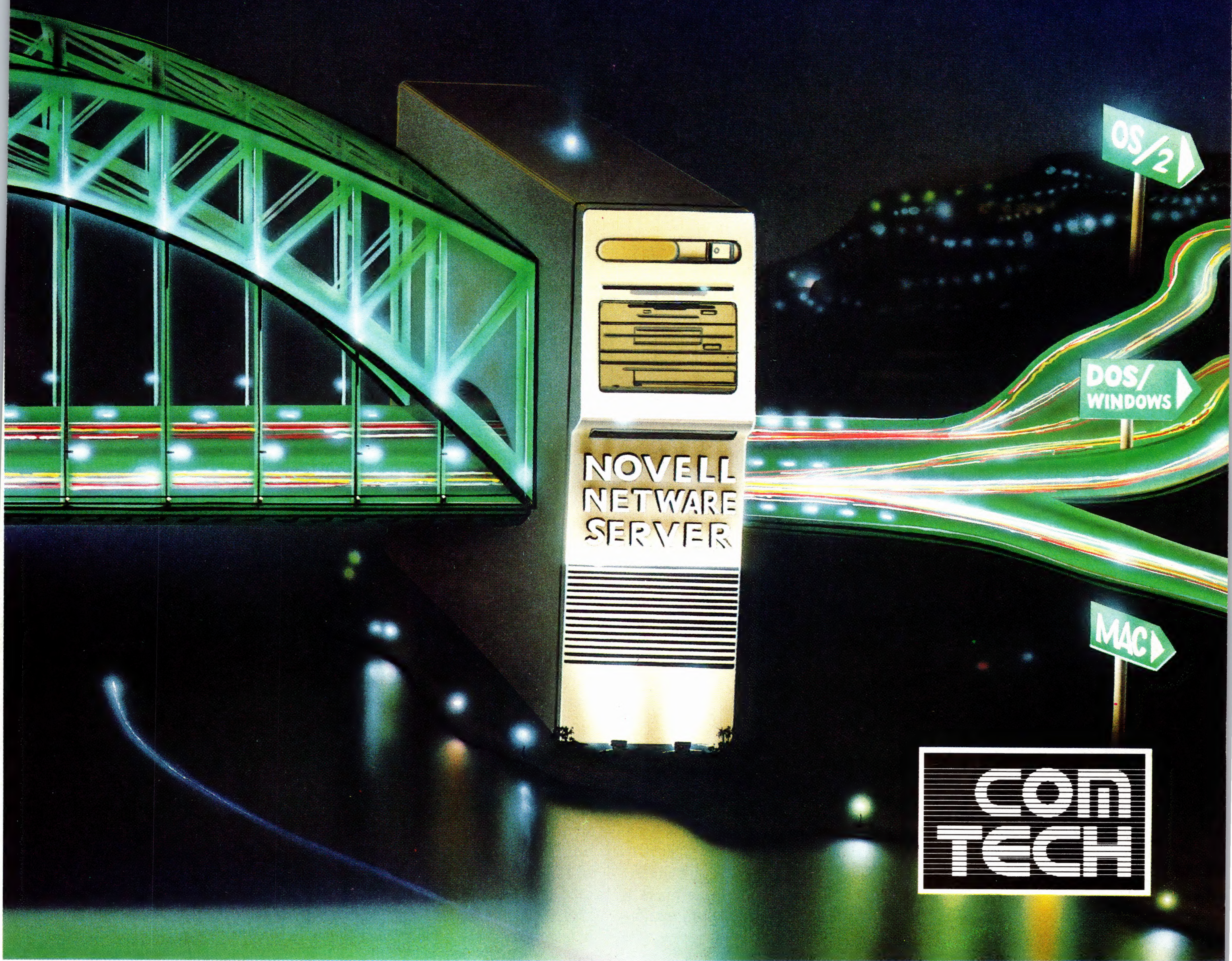

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IDAs Now Extended Until 1996

Industry, Technology and Commerce Minister, Senator John Button, announced in December that a new variant of the oft-maligned Industry Development Arrangements (IDAs) will now operate until 30 June, 1996.

Under the newly announced arrangements for the customer premises equipment (CPE) industry, all eligible participating companies will now be able to move from the scheme to the Partnerships for Development Program (PDP) or Fixed Term Arrangements (FTA).

To be eligible for the FTA scheme, companies must have sales to government of telecommunications hardware, software and services which exceed $10 million. The current IDA participants must have sales in excess of $40 million to move to the PDP scheme.

The changes also allow for existing PDP and IDA companies to enter the CPE market and be exempted from the IDAs, although the exemptions will be applied on a case-by-case basis.

In addition, the new IDA rules also boost the threshold on local content for cellular mobile telephones from 15% to 20% and the maximum points threshold to 30%.

Senator Button claimed that these new arrangements represented a sensible transition before the full deregulation of telecommunications in 1997.

Now in its fourth year, the IDAs were originally scheduled to end in July 1993, but this deadline was extended last year for an extra 12 month period. Participants supply equipment to the first telephone, PABX, small business system and cellular mobile telephone markets. To remain in the Austel-administered scheme, they must gain points by fulfilling local content, export of local added value, and R&D requirements.

Austel's most recent IDA report, which covers the first quarter of the scheme's fourth year, shows that 27 of the 29 endorsed suppliers claimed points for the period ending 30 September, 1992. They achieved revenues of $113.06 million for the quarter, of which over $65 million was for cellular phones.

OTC Wins Out in Sri Lanka

OTC will partner Sri Lanka Telecom (SLT) in providing a cellular mobile telephone service in Sri Lanka by the end of this year. OTC's proposal won out against a competing bid from a European consortium.

The new network will compete with two existing cellular services in Sri Lanka but it will have the advantage of access to SLT's existing network infrastructure. Within one year of launch the new service is expected to cover Greater Colombo, Kandy, Ratnapura and also Galle. In addition, the network will provide coverage to each Sri Lankan free trade zone.

OTC has also announced the formation of a joint venture company with the Muslim Commercial Bank in Pakistan to pursue new telecommunications investment opportunities arising in that country.

Will the TETF Boost Exports?

The creation of a new Telecommunications Export Task Force (TETF) to boost exports of Australian equipment and services was the only substantive feature to be found in the Government's long-promised telecommunications export strategy released in December.

Jointly announced by Transport and Communications Minister, Bob Collins, and Trade and Foreign Affairs Minister, Gareth Evans, the so-called 'strategy' calls for the TETF to 'decide market strategies based on priorities identified by industry.' This would apparently in turn lead to a 'more focused approach to existing government activities' in export-related areas.

The TETF will reportedly include representatives from the two carriers, equipment manufacturers and Federal Government departments.

Optus CEO, Bob Mansfield (left) and Victorian Premier, Jeff Kennett with Optus Group Leader,Campbellfield, Bruce Boswell (right)

Optus Build-Up Continues Apace

The holiday season didn't slow Optus' continued drive to get its own network up and running as the new carrier commissioned two crucial infrastructure elements in December and January.

In early December, Transport and Communications Minister, Senator Bob Collins, opened Optus' $100 million Sydney Technical Centre in suburban Rosebery. Built in only around six months, Optus' new Centre houses Optus' Network Operations Centre, switching equipment to link Sydney with the rest of the company's network, systems based around the company's evolving Operational Support System and the Optus National Technical Training Laboratory. It contains equipment from Optus' key suppliers, Nokia, Fujitsu, DEC and NorTel.

Optus CEO, Bob Mansfield, claimed the short building time is testimony to Australian dedication and know-how.

"Our overseas contacts are amazed that the world's most advanced telecommunications centre was built in only six months — they say it would have taken at least three times that long overseas."

In mid-January, Victorian Premier, Jeff Kennett, was on hand to officially open Optus' new $40 million Melbourne Exchange. Located at suburban Campbellfield, the exchange is housed in a refurbished warehouse.

Bob Mansfield said the new exchange represented only a small part of Optus' planned $300 million investment in Victoria by 1995. In addition, the company has selected a building in the Melbourne CBD for its planned Regional Headquarters. To be renamed The Optus Centre, the Collins Street building will house most of Optus' work force, which is expected to total 900 by the end of next year.

Ericsson Wins New Deal in China

Ericsson Australia has won a $12 million follow-on contract with the Chinese port city of Ningbo for the supply of 52,000 lines of AXE switching equipment and associated installation and training services.

The contract follows Ericsson's recently completed 1989 deal with Ningbo worth $42 million for the supply of 150,000 lines of AXE equipment.

In total, Ericsson claim that the Ningbo project is the largest telecommunications project undertaken by an Australian company in China. Under the new contract, equipment will be installed in exchanges controlled by nine different telecommunications administrations. Ningbo authorities plan to achieve a 10% penetration of local telephone services by the year 2000.

Optus Handles B2 Loss

Optus Communications claims that contingency plans laid before the loss of its B2 satellite will help minimise disruptions to customer services caused by the disappearance of the multimillion dollar spacecraft.

Launched from Xichang in south west China on December 21 and written off as lost the following day, B2 is unable to be contacted but did apparently make it into orbit. The exact cause of the loss has still to be determined, although Chinese Space Program officials were very quick to absolve their Long March rocket from any blame after the loss was confirmed. Satellite manufacturers, Hughes Space and Communications, will carry the cost of a replacement satellite and its launch, which is now expected to be in about 18 month's time.

Optus' plans now call for the transferral of its A3 satellite to its A2 satellite's location and moving all A2 services to A3 by April. The A2 satellite will then be placed in an inclined orbit to extend its life and provide a backup in case the replacement for B2 is delayed.

Optus B1, which was launched at the second attempt on August 14 last year, began commercial service in mid-December. It is now carrying traffic previously carried by the A1 satellite, which has reached the end of its planned life.

Austel Calls For Privacy Committee

Austel has recommended that a new Telecommunications Privacy Committee be established to address looming telecommunications privacy issues. The recommendation is contained in *Telecommunications Privacy*, a new Austel report released late last year.

Releasing the report, Austel Chairman, Robin Davey, said that the industry regulator was "suggesting a framework for privacy protection which will prevent the confrontation between consumer groups and telephone companies which has occurred overseas."

The proposed privacy committee would represent industry, consumers and government and would determine guidelines and approve codes of conduct submitted to it.

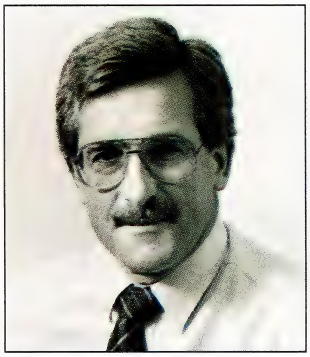
U-B Australia Targets Asia-Pacific

Ungermann-Bass Australia will now focus on the entire Asia-Pacific region after being appointed the regional base for the area (not including Japan) by its US-based parent.

U-B's new expanded regional base will be managed from a sales and technical support office in Hong Kong and there are also plans to have staff located in China, Singapore and Korea within the next few months.

U-B's strategy will be to target Asian-headquartered companies and also Asian operations of Australian and foreign firms, according to Managing Director, Philip Mellet, who expects the company's new Asia-Pacific business to be on a par with its Australia-New Zealand operations within three years.

"The local market for corporate networks today is 50 times larger than it was in 1985, and we predict the same growth in Asia-Pacific," he said. As a result, Ungermann-Bass Australia will triple in size in the next few years, he claims.



Philip Mellet

In Brief

Optus has revealed details of its upcoming Interlink package of international communications services. The package will consist of: Lightlink, a fibre optic service; Satlink, based on satellite transmission; and Splitlink, which will combine satellite and fibre optic transmission services. Interlink services will commence shortly.

Hewlett-Packard and **Ericsson** have announced a joint-venture company, Ericsson Hewlett-Packard Telecommunications AB, to develop and market network management systems for telecommunications service providers. Headquartered in Stockholm, the company is owned 60% by Ericsson and 40% by HP.

OTC has signed a Memorandum of Understanding with the Government of Vietnam to further upgrade and modernise its telecommunications. The agreement covers the upgrading of international facilities, the introduction of new advanced systems and the provision of network management and marketing expertise.

Nokia Telecommunications has joined the Government's Partnership for Development Program, proposing a seven year plan involving $120 million in exports and $25 million in R&D expenditure. The company has already awarded a $1.7 million R&D contract to CITR at the University of Wollongong.

Cray Communications and Telecom Federal Systems Group have signed a Memorandum of Understanding as an extension of the Telecom Enhanced Distribution Channel programme.

Cisco Systems and BT have struck a deal which will see BT becoming a worldwide OEM supplier for Cisco products.

BHA Computer, a Queensland-based computer software company, will supply its Network Management System to the Department of Defence's Defence Automatic Telecommunications Network (DATN) project. DATN will provide interconnection of communications facilities at Navy, Army and Air Force locations.

Ericsson Australia has won a $2 million contract from Telecom to install and commission a GSM model system in Parramatta (NSW). The system will be used for software verification trials.

Optus will charge $2.2 million per year, per channel for a six channel per transponder configuration and $2.5 million for a four channel per transponder configuration for its premium Pay TV service. A basic service will also be offered, but operators will have to provide their own compression and uplinking facilities.

Bull HN has formed a strategic alliance with Telecom's Enhanced Distribution Channel Group. Under the new agreement, both organisations can sub-contract the skills and resources of the other party, or jointly submit tenders for projects.

Chester (Chip) Barton has been appointed Managing Director of AT&T Australia. Mr Barton replaces John MacDuffie, who has been appointed Managing Director of AT&T Hong Kong.

Com Tech has been appointed the first Lotus Notes distributor in the world. The company will be responsible for providing Lotus' Australian resellers and consultants with product and support.

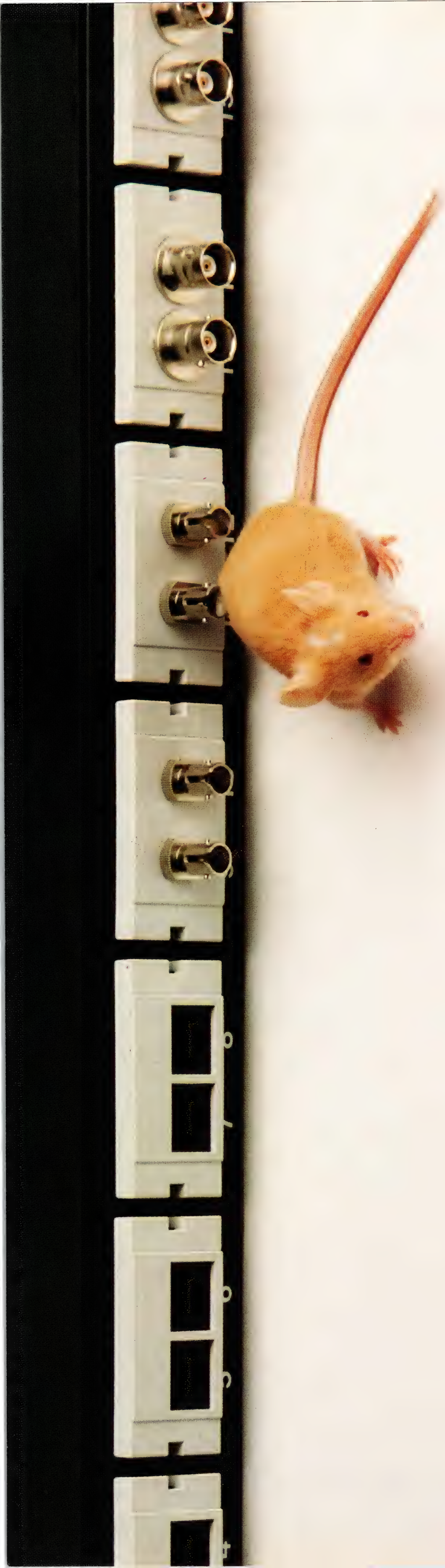
BIS Shrapnel predict that Australian mobile telephone subscriptions in will grow by 150% by 1997. The prediction is contained in its recent study, *Mobile Communications in Australia, 1992.*

Alex Arena has been chosen by the Hong Kong Government to establish and head its proposed new telecommunications body, OFTA (Office of the Telecommunications Authority). Mr Arena was appointed a Member of Austel in October 1989.

Michael Clayton has won a 12-month secondment to the Special Mobile Group of ETSI (European Telecommunications Standards Institute). Before joining ETSI last month, Mr Clayton was Business Development Manager for Security Domain.

The University of Technology, Sydney and the **University of Sydney** have established the Australian Graduate School of Engineering Innovation (AGSEI) to enhance product development in the Australian telecommunications industry.

Philips Australia recently won a $1 million order from Hughes Aircraft Company to supply another consignment of microwave R-Switches between March and September 1993. This is the ninth consecutive order for switches that the company has received since its satellite facility was established in 1988.



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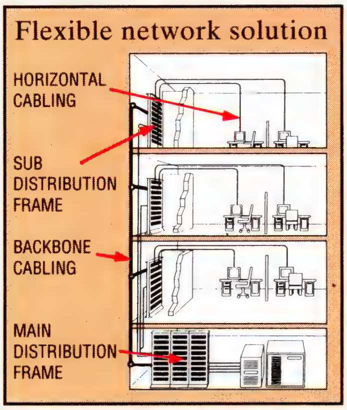

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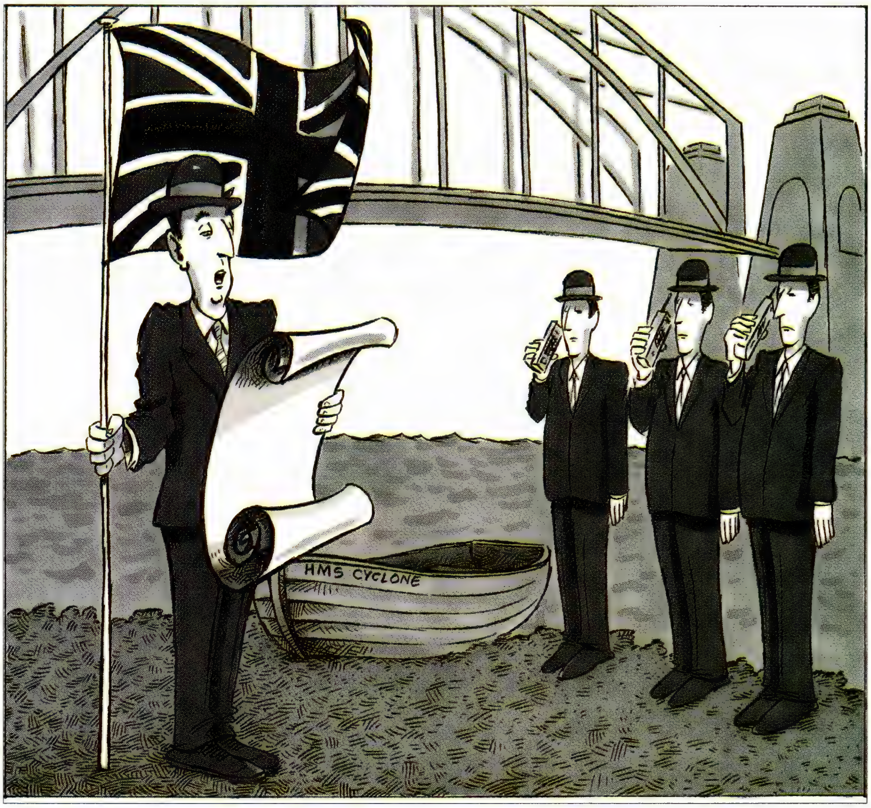
BT Claims New South Wales

BT has paid a premium for a future head start in a fully deregulated Australian telecommunications marketplace.



The selection of BT Australasia to design, develop and build the NSW private network ends a saga spanning six years and four State Premiers. While the decision cements a role for BT (formerly British Telecom) in Australian telecommunications, typically it was not without some controversy.

The NSW Government's first choice, the Horizon group, declined to take up the contract after haggling over financial arrangements for six weeks. According to Horizon — a consortium involving the Nine Network, Bell Canada and Clear Communications and Broadcasting Communications Ltd (BCL) from New Zealand — the contractual conditions were too onerous.

The contract requires savings of at least 12% on the 'best carrier price,' as well as substantial local industry development commitments. BCL Managing Director, Gerry Moriarty, said although both sides had tried, Horizon could not see it as a successful commercial arrangement.

He said the margins on network management were "not large," making it "very difficult" to meet the Australian industry requirements. "Likewise, the conditions under which the guaranteed savings to the Government were being measured made it potentially unachievable," he said. "It's how you define savings and how you measure what you achieve in terms of savings. That is hugely complicated."

According to NSW Premier John Fahey, savings over the 10 years would amount to $280 million. BT will probably take about half a billion dollars over the contract period, but these are substantial shavings. For example, BT will offer even on-net local calls at 20% lower than the standard 25 cents.

BT Australasia's NSW Account Director, Charles Rizzo, says the risk is manageable. "With the modelling we have done we're confident that the savings can be made through aggregating whole-of-government traffic," he said.

The key was in volume: Building it up, managing it smartly and efficiently and, in the case of virtual private networks and even digital data, getting whole-of-government discounts, he said. "Like any network, we have to be efficient how we route calls through the network."

One industry source told *Australian Communications* he thought BT could be 'buying' the contract. But Rizzo said while it was strategically beneficial, the project stood on its own commercially.

A Major Future Presence

However the calculations pan out, BT's willingness to become a high volume, low margin network manager is an indicator of the importance of Australia as a way into the region. The Asia-Pacific market has been forecast to grow from $US60 to $US200 billion over this decade. To date, BT has had only a marginal Australian presence, with about 60 staff, supporting services such as Syncordia and GNS.

When the Aussat privatisation began two years ago, BT was thought one of the most likely contenders, given the close historical links between British and Australian telecoms and BT's interest in the region. But BT did not bid, following a decision not to become a domestic carrier outside the UK. Instead, the company has set itself the task of being one of the two leading global carriers by the end of the decade.

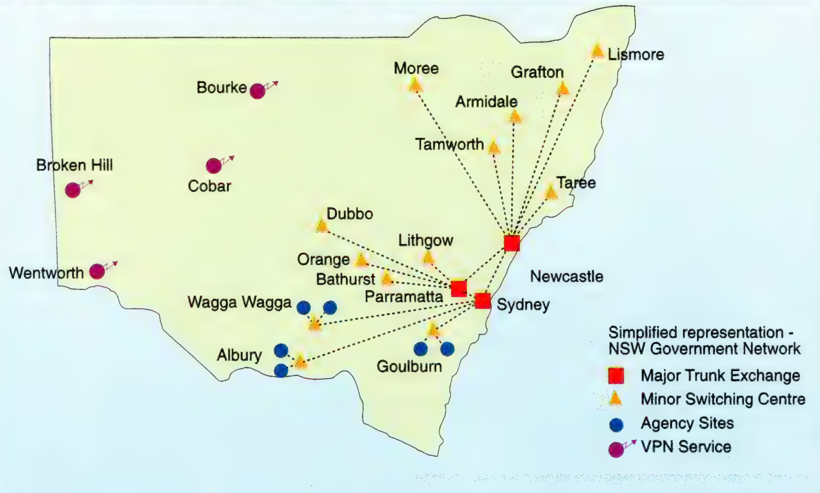
In that light, the NSW network deal provides an excellent regional platform for BT's key market, multinational corporate customers, not to mention a strong position for the post-1997 free-for-all in Australian telecommunications. BT points out that 80% of UK multinationals have a significant presence in Sydney.

Sydney will also become BT's regional hub, providing network management, support and R&D. The city will also play host, along with Frankfurt, London and New York, to a node for Project Cyclone, BT's grand global networking scheme. According to Rizzo, BT found Singapore more attractive commercially, although Sydney was seen to have more depth of skills.

This is also BT's largest private network outside the UK, and important enough for Chairman, Iain Vallance to visit Sydney in the latter stages of the bid. While Telecom was dramatically bumped out of this project by then Premier Nick Greiner, it will still earn about 60-70% of traffic revenues. Based on a current figure of $120 million, that's about $75 million, although it might decline as the NSW Government reaps the benefits of aggregation. Much of this will come through CustomNet Horizon, which will be implemented in full from July 1993. Horizon will provide links to remote areas and also diversity in the case of disaster.

At time of publication, the time period for the Horizon agreement had not been deter-

The NSW Network



The NSW Government private network will provide telephone, data and ISDN service to carry traffic from government departments, statutory authorities and enterprises.

The digital private network, underpinned by CustomNet Horizon, will link 5,000 sites including 120,000 telephones and 23,000 computer terminals. Of the 5,000 agency sites, about 2,500 to 3,000 will be connected directly to the network. Installation of the infrastructure (the contract does not cover CPE) will take about two years. BT will bill the various agencies for the traffic carried and will pay the carriers on the Government's behalf.

The private government network will have three trunk switches (Northern Telecom DMS Supernodes), 13 PABXs as intermediate switches for small towns (NorTel Meridian) and about 1,000 Jtec-supplied multiplexers. The Network Management Centre will run BT's OSI-compatible Concert integrated management system.

The billing system will be Monies, from the Stonehouse Group, provided locally by Focus Communications. Some local services will be provided by Ferntree (data processing) and Hardie Technologies (field services such as equipment maintenance).

mined, but Rizzo stressed that for competitive reasons there would opportunities for Optus down the track.

The other side of this contract are the industry commitments. These aren't cheap. BT is contractually committed to spending just under a billion dollars over the 10 year contract period, including $600 million on procurement by the BT parent company from Australian sources. These commitments will be audited, with liquidated damages for non-compliance.

The commitments come in three levels. The $320 million commitment in Level One includes $160 million investment by BT in an Asia-Pacific hub and $56 million on the network management centre — 70% of network spending must be locally sourced.

BT also has committed to spending at least 5% of revenue on R&D, most notably the Software Engineering Centre at the soon-to-be-established Advanced Technology Park, Sydney. This will facilitate closer links between Australian researchers and the BT Labs, Martelsham, aided by two BT-funded fellowships to the Labs each year.

In Level Two, BT Plc is committed to purchasing $600 million in local equipment and service. With the third level, which is not a contractual commitment, BT says it can help facilitate accreditation to European markets for Australian companies. According to the company, this will mean local opportunities worth up to $1.46 billion.

For the NSW taxpayer, all of this should mean cost savings in the short term. Over the medium term, as new services are rolled out it should mean access to advanced services such as telemedicine, video services and the use of 008 and CustomNet. BT says it will create 140 new jobs directly, as well as spin-off jobs in local industry.

The NSW Government was expected to let the tender for its mobile radio services early in the New Year.

Robert Clark

Queensland, NSW Lead the Way

While NSW, after six years of stops and starts, has decided on a network manager and a framework and Queensland in June last year selected Pacific Star Communications to manage its telecommunications services, the picture is not so clear for other government networks.

In mid-1992 the Victorian Government considered selling its State network manager Vistel to Telecom. That deal fell through but the new Coalition Government is expected to push for private sector involvement in the wholly government-owned company. Vistel Marketing Manager, Robin Bray, said the Government was happy with the savings already being made, but wanted to bring a private operator into play. This is not likely for some time and at this stage it is not certain what form the move would take — privatisation, a joint venture or something else.

In South Australia, the Information Utility (IU) has won an Agriculture Department contract to develop its IT&T and is also carrying out a feasibility study for mobile radio to replace separate systems for 28 government agencies.

The SA Government is committed formally to the IU, but its funding is unclear, pending consideration of its just-completed business plan. The plan covers telecoms services, VAS, data processing and financing and is being considered by the government and its partners AOTC-Navigator, DEC, Andersen Consulting and Lane Telecommunications-NTT.

On the Federal scene, the Telecommunications Policy and Advisory Unit was expected to sign an agreement with CustomNet Horizon some time in January. The Unit is now studying a report on the prospects for aggregating government communications.

In the March edition of

AUSTRALIAN communications

RESALE
As well as empowering a second carrier, the new Australian telecommunications environment legitimises resale. Next month we take a look at how resale works.

SMART HUBS
Intelligent wiring hubs have become the building blocks of corporate networks. Next month we publish a hands-on evaluation of the market leaders.

FIBRE-TO-THE-HOME
Telecom has been more guilty than most of its peers around the world in promising unrealistic fibre-to-the-home plans. Next month we examine what's involved.

SMP
SMP, the simple management protocol, is looming as a successor to the very successful SNMP. In our next edition, we take a close look at what it promises.

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Mobile Communications

Arena's Third Mobile Licence

The Government's announcement in December that the Vodafone company, Arena GSM, had won the third public mobile carrier licence came as no real surprise to most industry observers.

Early in the selection process, Arena formed an alliance with one strategic partner, Australian Associated Press Information Services (AAPIS), and developed an attractive package that included a promise to provide less expensive services through its patented Micro Cellular Network (MCN) technology. By contrast, the original SinTel consortium (Singapore Telecom International and Stanilite) was joined by Pacific Telesis of the US at the 11th hour, suggesting that its business plan was still changing.

Aside from Arena's boost to Government coffers via a $140 million entry fee, the company expects to order capital equipment worth $400 million from local suppliers and to spend $150 million on services such as software and salaries over four years. It has calculated that up to 5,000 jobs will be created through the operation of a third Australian GSM network, through the service providers that resell network capacity and through the extra business flowing to local equipment and software suppliers.

Announcing the industry and employment benefits that are expected to flow from Arena's selection, Senator John Button, the Minister for Industry, Technology and Commerce, highlighted the company's commitment to setting up an Asia-Pacific headquarters in Australia. In particular, he pointed to the business relationships Vodafone has formed in India, Korea and Hong Kong, and the plan to use "Australian expertise in telecommunications, engineering, accounting, law and other services to bid for and operate overseas mobile telecommunications networks in the Asia Pacific region."

Senator Button also praised Arena's "significant training program" which includes a promise to spend an annual $1.2 million on training and to set up a Youth Training Scheme. In research and development, a group comprising Arena GSM, its suppliers and major tertiary institutions has budgeted to spend at least $25 million over the next five years on digital communications. Arena will provide an annual $1 million to seed the funding of this research and development work.

Finally, the Minister highlighted Arena GSM's plan to carry out pre-personalisation of the GSM Subscriber Identity Module (SIM) cards in conjunction with Exicom. This will be the first widespread application of smartcard technology in Australia.

A Few Concessions

In the announcement by Transport and Communications Minister, Senator Bob Collins, there were signs that Arena had managed to negotiate a more predictable business environment during the selection process. Indeed, given the windfall entry fee, it would be surprising if Arena had failed to extract some concessions.

Senator Collins said that "in the context of the Arena agreement," the Government had decided another mobile operator would not be licensed before 1997 — a policy shift that effectively pre-empts the mobile review scheduled for 1995. Further, Collins reaffirmed that Telecom's current analogue Advanced Mobile Phone System (AMPS) must cease by 2000.

Arena GSM's Philip Cornish, who led the successful bid, would not comment on the selection process other than to reject the criticism that the entry fee was too high. "We have a sound and conservative business plan in terms of tariffs, rollout and market share projections," he contended. "The target is 33% of the GSM market within three years."

Unlike the second carrier bidding process, Arena had to develop a business plan without knowing the charges for interconnection of mobile calls to and from the fixed network. Cornish refused to comment on whether Arena expects to secure discounted (directly attributable incremental cost-based) charges similar to those given to Optus for use of Telecom's local network.

Since both Arena GSM and Optus must separately negotiate mobile interconnection charges with AOTC, does this place AOTC firmly in the driver's seat? Not according to Cornish. "We don't feel at a disadvantage, because the regulatory structure reflects the fact that there are three carriers. In fact, Vodafone is accustomed to dealing with two wireline carriers in the UK, as is AAP in Australia."

On the issue of when Arena will achieve majority Australian ownership, Cornish said there were no plans to float the business until it was profitable and had a track record. He suggested this may take about five years. Certainly, it will be before the Government's deadline of 2003.

Liz Fell

Mobile Communications

D-Amps Launched in New Zealand

Telecom New Zealand's Telecom Cellular subsidiary launched its digital cellular service in mid-December, pre-empting BellSouth's GSM service. Telecom Cellular's system was scheduled to go live last month, while BellSouth is not expected to start until March. Telecom Cellular will use its recently acquired Amps-A frequency band.

Telecom Cellular's digital network uses digital Amps (D-Amps) technology, essentially an American system currently only used in the United States, Canada and Hong Kong. With New Zealand's main trading partner Australia opting for GSM technology, this may prove to be a weakness when it comes to competing against BellSouth.

Compared to Telecom Cellular's existing service, the D-Amps system promises higher call quality, longer battery life and increased security. The marketing emphasis for both digital cellular systems is likely to focus on this last feature with cellular phone security currently a hot issue in New Zealand.

The new service can potentially manage up to three times as many users as at present (the Amps-A band carries 666 digital channels). With New Zealand's relatively uncrowded main cities already starting to experience cellular congestion this is a significant advantage to Telecom Cellular and all its customers.

However, unlike the BellSouth service which will be entirely digital, Telecom Cellular's digital cellular network will operate alongside its existing analogue service. This means Telecom Cellular's digital service customers need to use special dual mode handsets which switch between digital and analogue operation. They will not be able to use existing analogue cellular telephones, nor will they be able to use the same handsets as BellSouth's GSM users.

This incompatibility is likely to fracture the cellular phone market as few phone makers will supply handsets to both networks. What is more important, the lack of competition in the D-Amps handset market will probably keep the entry cost high and act as a barrier to potential customers. On the other hand, New Zealand's deregulated telecommunications market provides an ideal stage for a competitive shoot-out between D-Amps and GSM.

According to Telecom Cellular, a number of suppliers will offer dual mode handsets and they will be priced 'around the top end of existing cellphone prices.' Connect charges and call charges will be the same as existing Telecom Cellular analogue rates.

With analogue handset prices already dropping in anticipation of the introduction of new digital services, it is likely the dual mode handsets will cost considerably more than straightforward analogue or GSM handsets by the time the market starts to move.

Telecom Cellular Managing Director, Neville Wishart, predicts between five and 10 companies will be manufacturing D-Amps handsets by the end of 1993. This should spark competition and act as a break on prices. More importantly, Mr Wishart

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said he expected D-Amps compatible digital cellular phones to account for between 10 and 30% by value of all cellular phones sold in New Zealand this year.

Right now the only maker of dual mode cellular handsets to announce availability in New Zealand is Ericsson Cellular Ltd. Speaking at the launch of the new service, Ericsson Cellular Managing Director, Torbjorn Smith, was unable to put a price on his new Hotline handset — a sure sign it will not be cheap. He said that its price would be compatible with existing high-end analogue handset prices.

It isn't difficult to see why the handset is expensive. Ericsson boasts its handset contains more computing power than two Intel 486 processors. At present all this power is dedicated to signal processing, though both Telecom and Ericsson expect to announce more computer oriented data communications products for the network in the future.

Given the dual mode nature of the handset, it is surprisingly small and lightweight, weighing just 335 grams and measuring only 150 by 60 by 25mm.

For Telecom Cellular's customers, dual mode operation makes a great deal of sense. Telecom Cellular's digital service is far from national and is likely to remain that way for some time. Initially Telecom's digital cellular network will only be available in Wellington. Auckland and Christchurch will be added to the network over the next few months, and the remaining main centres will be progressively added during 1993.

Mr Wishart said Telecom Cellular will expand coverage to the rest of its network as demand dictates. Currently the analogue network covers 95% of the New Zealand population and caters for 90,000 customers.
Bill Bennett

Fibre-to-the-Home

It's on in Wollongong

At a press conference during ATUG '92 last May, Telecom's new boss Frank Blount surprised me by saying that Telecom had no plans to put fibre to domestic subscribers. Not six months previously I had been present at the launch of Laserlink, Telecom's plan to provide 'optical fibre capabilities to the business and home.' (See 'How Telecom Will Bring Fibre to (Some) Homes,' *Australian Communications*, April 1992.)

"What about Laserlink?" I asked him, and he thought I was talking about Lightstream, the first service to be offered on the Tasman 2 cable!

Well Blount is now somewhat better briefed on Telecom's vast range of products and projects, but his vehement denial did prompt me to reread the original Laserlink launch material. Hence the quote above. Note the word 'capabilities': Not fibre itself. The latest thinking seems to be that fibre to street corner pillars, to which Telecom is committed, coupled with new data compression techniques on exiting twisted copper pair, or the use of coaxial cable, might be able to bring the capability of fibre-to-the-home (i.e. very high bandwidth) cheaper than the use of fibre itself, or at least sufficient bandwidth to meet anticipated demand for new services.

In fact Telecom's plans for the township of Gungahlin near Canberra will use exactly this hybrid delivery technique: Over 1,000 homes will be served by fibre-to-the-curb, and coaxial cable for the last few metres.

But its plans for fibre-to-the-home have still not gone beyond small scale engineering trials. In November, Telecom announced plans to put fibre to about 140 residential premises and 60 businesses in Wollongong. One of the main purposes of the Wollongong trial will be to determine exactly how much it does cost to put fibre optic cable, and all the associated opto-electronics to domestic premises.

Speaking at its announcement, Blount stressed the engineering emphasis of the trial. "I acknowledge that there will be a lot of interest in the 'bells and whistles' which may be tested on the fibre platform, but the core objectives remain our need to find the best and cheapest way to push fibre closer to residential customers," he said.

He did add that the other aim of the trial was "to work at strengthening our understanding of customer needs." However, it is questionable just how much information will be provided from such a small customer base. Simulations of glamorous interactive services over fibre, provided by Telecom at the Laserlink launch, and equally popular with the operators of other fibre-to-the-home trials, have featured teleshopping, interactive education etc. With only 140 customers to play with, what training organisation, supermarket etc. will be willing to put in the considerable effort required to set up such a service for real?

An off-the-cuff remark from Ian Reinecke, head of the Centre for Information Technology Research at the University of Wollongong, reinforced these doubts. Reinecke had been in contact with the manager of a large fibre-to-the-home trial in Seattle, Washington, and the feedback he'd gained was that if you seriously want to trial services and not technology, you need about 10,000 customers.

So just how serious is Telecom about fibre-to-the-home? The Wollongong trial is already less than half the size of what was envisaged in 1991 when Telecom was evaluating tenders from bidders for equipment to support the trial: The number talked about then was 500 customers.

Stuart Corner is the Editor of Exchange.

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Satellites

Rimsat Puts Tonga on the Map

November's announcement by a new US-based company, Rimsat, of plans to provide geostationary satellite services for the Asia-Pacific region looks like clinching victory for former US satellite executive and budding entrepreneur, Matt Nilson. His victory follows a two year battle with the International Telecommunications Union (ITU) over the rights of his joint venture company, Tongasat, to the last available geostationary orbital slots capable of providing coverage of the fast growing Asia-Pacific region and, importantly one-hop satellite links between this region and the US.

ITU regulations, thrashed out by international agreement among its over 160 or so member nations, provide for each member country to have priority in claiming geostationary orbits which will allow it to provide domestic satellite services. The country in this case is the tiny island kingdom of Tonga. What the very cheeky Mr Nilson did was to form a joint venture company with the Tongan Government, and then to use his experience and expertise to negotiate the labyrinthine bureaucracy of the International Frequency Registration Board (IFRB), the arm of the ITU which administers orbit allocations, and put in an application on behalf of Tonga, which two years previously had no telephone dialling capability with the outside world.

Intelsat, the mighty international cooperative which has for years enjoyed a near monopoly on international satellite communications, was outraged. It accused Tongasat of speculation; of planning to sell the orbital allocations for commercial gain.

Intelsat's then Director General, the late Dean Burch, wrote to ITU Secretary General, Pekka Tarjanne, insisting that the Tongasat plan must be stopped. He claimed to have the support of all 119 Intelsat signatories. However, the ITU's rules could not prevent the Tongasat manoeuvre, and the rules could not be changed until the WARC '92 conference, then two years away.

Nilson did however, eventually moderate his claims. Tongasat had initially applied for 31 orbital locations and been granted 27. He told the Pacific Telecommunications Council Conference, in January 1991 that he had reduced this to 16.

Not content with this coup, Nilson last year used the vehicle of Tongasat to apply for the new low earth orbit satellite (LEOsat) allocations created by WARC '92 — stirring up another controversy which has yet to be resolved. Meanwhile, he has also taken advantage of glasnost and perestroika to do a deal with the Russians and move spare satellites into the Tongan orbits. This enabled him to engineer the launch of Rimsat in November and announce plans to begin services this February without launching a single satellite.

Pie in the Sky?

Rimsat, a company whose financial backers have still not been announced, has acquired the orbital locations from Tonga and says it has signed a $US150 million contract with Informcosmos, a consortium of commercial satellite manufacturers in the Russian Republic, to build, launch and lease seven satellites, in addition to the two existing ones, which will provide services from this month. In addition, Rimsat has a 10 year $US250 million option to purchase 10 new satellites to place in Tongasat positions or others.

The Russian Satellites Are Also Coming

Smolsat and Global Information Systems (GIS), both Russian companies, are planning to offer commercial satellite services to customers in the Asia-Pacific using low earth orbit (LEO) and advanced geostationary orbit (GEO) technology formerly reserved for military communications.

An exciting demonstration of the global messaging and position determination capabilities available through Smolsat's LEO spacecraft, known as 'Gonets,' was provided at the WARC '92 conference organised by CIRCIT in Melbourne last December. Using a small portable terminal and a laptop PC, participants watched the arrival of a marker signal (advising that a Gonets-D had entered radiovisibility), followed by an e-mail message that had been stored and forwarded to Melbourne from Moscow.

Smolsat is a Moscow-based consortium of service providers and small satellite manufacturers including the Scientific and Production Association of Precision Instruments (SPAPI) and the Scientific and Production Association of Application Mechanics (SPAAM).

With two experimental spacecraft in operation already, Smolsat is planning by 1995 to launch a 36-satellite GEO system into near circular polar orbit at an altitude of 1,300-1,500 kilometres. Second generation Gonets will carry telephony and real-time data using inter-satellite links and frequencies in the 300 MHz range.

Global Information Systems (GIS) is another Moscow-based consortium planning to commercialise advanced GEO technology previously only available on military communications satellites.

With finance guaranteed by the Central Bank of Russia, GIS is currently constructing the GloboStar system which will have a minimum of three 16-transponder satellites for use by customers inside and outside the Russian Republic.

The GIS consortium includes the Association of Independent Banks of Russia, Sovfintrade (a commercial trading company) and several leading aerospace and payload designers/manufacturers such as the Lavochkin Association which designed and built the spacecraft that made the first soft landings on the Moon, Mars and Venus.

The first two Ku-band GloboStar spacecraft, which are called 'Coupons,' are scheduled for launch by Proton in 1994. A third hybrid Coupon operating in both C and Ku-bands will offer service in the Philippines when launched in 1995.

Using a phase array antenna system and a remotely controlled master earth station, GloboStar will provide users with customised footprints. Each transponder will have independent, electronically steerable receive and transmit spot beams which can be adjusted for both size and power levels. An on-board switching matrix will route traffic between any footprint beam. GIS executives say this flexible design will be ideal for users seeking tailored space or time-based services for applications such as: Direct broadcast TV to specific locations through high power spots; point-to-point telecommunications employing low power beams; and news gathering using steerable spots and low power terminals.

Until the first GloboStar spacecraft is operational, GIS will access existing space capacity to set up the 'Bankir' satellite network for financial institutions in Russia and the CIS using Very Small Aperture Terminal (VSAT) technology.

Other plans include leasing spare GloboStar capacity to customers outside Russia within the coverage area and the marketing of VSAT networks to developing countries and multinationals using hardware developed for the Bankir network.

At the Asia Pacific Satellite Summit organised by IIR in Hong Kong during December, GIS executives announced a joint venture with The Communication and Broadcast Managers Inc. (TCBMI), a Philippine company in the diversified Galaxy group, which will invest $US65 million initially in the GloboStar system.

Through the new GIS joint venture, known as Galaxy Satellite and Telecommunication Co., TCBMI has secured a Russian Coupon satellite for the Philippines, a move that appears to pre-empt the outcome of a recent domestic satellite feasibility study commissioned by the government.

Liz Fell

Rimsat Service Schedule

February 1993	Existing Raduga and Gorizont satellites moved into orbit
September 1993	New Gorizont 1
February 1994	New Gorizont 2
September 1994	New Express 1
June 1995	New Express 2

Rimsat claims that existing satellite systems will be incapable of meeting demand from the region and that other planned systems are unlikely to get into orbit. Speaking at the launch of Rimsat, Chief Operating Officer, Michael Sternberg said: "Demand will become more intense as we approach the end of this century, for even though markets will continue to grow, industry consultants predict that some scheduled satellite launches by existing and potential new providers will not occur due to lack of financial support. Of the 14 satellites scheduled to be launched for new services before the end of the decade, industry observers believe that 11 are expected to be cancelled."

He said this would create an estimated shortfall of satellite service capacity of over 100 C-band transponders and in excess of 80 Ku-band transponders by 1996.

Sternberg said Tonga's orbital positions were ideal. "They are located precisely to provide service to a vast area that runs from East Africa and Europe to Asia and the Middle East, east to the mid-Pacific, including the Hawaiian Islands. Included in that area are all ASEAN countries, all other Pacific Rim nations, including the entire Peoples Republic of China, the Islands of the South Pacific, Australia and New Zealand, plus the nations and islands of East Africa. The Tongasat positions are of major importance to Rimsat customers because the 'line of sight' angles from earth stations to satellite are very high, which means minimum interference or blockage of earth stations can be caused by tall trees and buildings. This is a major advantage for servicing the region."

So, is the battle over? Has Nilson won? Not yet, it seems. US newsletter, *Space and Satellite News* was able to find a few sceptics who suggested that several countries would not give Rimsat permission to operate in their territory because they did not want to be seen to be condoning Tongasat's subversion of the IFRB registration process.

S&S News also quoted Nilson claiming that there had been a change in attitude toward competition in the region over the past two years, and it quoted Sternberg saying several nations had signed letters of intent which would be converted to full time transponder lease contracts.

Stuart Corner is the Editor of Exchange.

ISDN Technology Update

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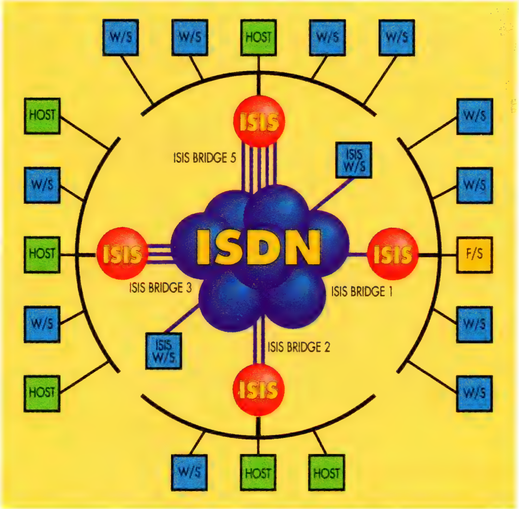

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IMPORTANT NEWS

Australian Industry

Stanilite Keeps Growing

For a company that started out producing emergency evacuation lighting 16 years ago, there's been little dancing in the dark recently for Stanilite Pacific. Just the opposite; the company's future looks so bright, the only possible shadows are those cast by the benevolent wing of Australia's defence and national security forces.

With 11 out of the top 14 investment institutions in Australia on its share register, Stanilite has made the kind of strategic acquisitions — Uni-Lab Telecommunications and TR Services within a year — that should ensure its commercial horizons continue to expand. And going commercial is what Stanilite is all about. While the company was disappointed at not winning the third mobile licence in consortium with Singapore Telecom (SinTel) and Pacific Telesis (PacTel), there were positive outcomes from the exercise, according to Joint Managing Director and company founder, John Harriss.

"Our group was not prepared to bid anywhere near $140 million offered by Arena," Harriss said. "Our main prize was developing relations with SinTel and PacTel. During the bid process we got closer and they became more aware of our products and capabilities. As a telecommunications supplier, you need every relationship you can possibly form with carriers."

According to Operations Director, Barry Nicholas, a Navy technical communications specialist for nine years, the main reason for the shift towards commercial sales is the cyclical nature of defence contracting. "We are trying to build up the commercial side to balance out the irregularities in defence contracting. It would also be very reassuring for Defence to know that we are not entirely dependent on them," he said.

Queensland-based TR Services, which dates back to 1922, was bought from Optus Communications' UK equity partner, Cable & Wireless, for $2.5 million in mid-December. The significance of the purchase is that while another recent acquisition, Perth-based Uni-Lab, designs and manufactures cellular/trunking switches, TR Services provides national trunk and two-way radio base sites, frequencies and sales and services. The synergies are ideal; a manufacturer on the one hand, a service and support operation on the other. The business predominantly involves commercial transport operations and public transport groups such as bus operators and government transport authorities.

Stanilite's biggest coup was winning the $150 million contract to supply internal and external communications systems for the 10 ANZAC Frigates under construction at Williamstown for the RAN and the Royal New Zealand Navy. Potential future defence business includes an Air Defence Ground Equipment (ADGE) contract, worth $7 million; more ANZAC Frigate business; the proposed Minehunter Coastal project involving six vessels worth around $20 million; and an oceanographic ship contract worth $15 million. The company also recently won a $3 million contract with Esams, a division of the UK's General Electric, for a communications subset for the F-18 simulator program.

One of the products in the forefront of Stanilite's commercial hopes and dreams is a new Distribution Matrix, or Tactical Intercom Switch, a 256-port digital voice and data unit. Stimulated by defence force requirements, the unit incorporates what Stanilite Executive Director, Brent Dowsett, described as "probably the most complex electronic circuit board ever assembled in Australia." Twenty of the Distribution Matrixes, at around $100,000 each, should be delivered towards the middle of the year under the first stage of the ANZAC contract.

But through Uni-Lab, Stanilite perceives an enormous commercial potential for the unit. So far, several million dollars have been spent on research and development of the Distribution Matrix. Of the 450-odd staff now under the Stanilite umbrella following the Uni-Lab and TR Services acquisitions, 90 are highly qualified electronics and communications engineers involved in R&D.

Also high on the Stanilite development list is its Simulator Data Monitor (SDM) products, two units designed for the Navy's new Collins-class submarines. One SDM is located in the submarine's command centre and connected to the six torpedo tubes. The second unit sits between the command centre monitor and the torpedoes, allowing simulated torpedo firings.

Overseas, China and Vietnam are the prime targets for Uni-Lab's rural telephone and trunk radio equipment, with opportunities also being pursued in Hong Kong, Pakistan and Botswana.

Stanilite's involvement with the Communications Cluster of Australia (CCA), a joint marketing venture involving five Australian companies (see 'Manufacturers Find Strength in Numbers,' *Australian Communications*, October 1992), has already begun to pay off. The company recently won a $500,000 contract with another member, Brisbane-based Mitec, for microwave hops in Vietnam, with further contracts being negotiated with the Vietnamese Government. Talks are also underway to supply Uni-Lab equipment in Vietnam, with a cell switch installed in Ho Chi Minh City for evaluation.

In Poland, where Uni-Lab won the right to establish rural and trunk radio networks, Stanilite now has its own Polish-speaking representative engaged in due diligence on the UniNet project.

Bernard Levy is a freelance journalist based in Sydney.

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Australian Industry

Exicom Looks Offshore

After an extended period of international and domestic rationalisation, telephone equipment and service supplier Exicom Australia is looking further afield and pinning its hopes for future growth on export markets in the Asia-Pacific and the Middle East. Like many other local suppliers faced with diminishing returns in the partially deregulated and seriously recessed Australian market, Asia is looking increasingly attractive, not just as a market, but as a low-cost manufacturing base.

Not that the domestic picture is altogether bleak. Exicom remains a major supplier of telephone terminals to AOTC while at the same time, the recent victory third mobiles licence of Arena GSM has opened up new opportunities for Exicom to widen its customer base and decrease its dependence on AOTC. (In 1991-92, Exicom supplied 800,000 telephones to AOTC, of the 1,000,000 it produced; the remainder were exported. But this represented only 25% of its revenues).

Heavily involved with Arena during the third mobiles tender process (former Exicom Managing Director, Philip Cornish, is now MD of Arena GSM and a minority Exicom shareholder), Exicom has signalled that it expects to benefit from the 'local content' conditions of the third mobiles licence. With Cornish as the 'bridge' between the two companies, Exicom believes it may have access to up to 50% of Arena's shopping list,' ranging from installation of plant to adding value to GSM and analogue handsets.

Specifically, Exicom expects to be involved as a sub-contractor in the installation of microwave links, as well as providing service, support and maintenance. Such work would be carried out by Exicom Communications Systems, which has been merged with Melbourne-based J&R Communications, acquired last year.

The acquisition of J&R Communications, with around 120 staff, was aimed at strengthening Exicom's business telephone systems sales drive by adding J&R's cabling, installation, maintenance and project management skills. J&R staff have now been relocated from Ferntree Gully to Exicom Communications' premises at Springvale in Melbourne. The relationship has already boosted revenues, according to Exicom.

But Exicom has an even grander plan for the domestic market, positioning itself to become the major local commercial installation company for the three carriers.

"With AOTC cutting its telephone terminal inventories from three months to one month, meaning we lost two months of production and sales, we have had to face the reality that terminals are not the only game in town," a company spokesman said.

"Increasingly, the carriers will use subcontractors to carry out installation and maintenance work, as Optus has done, rather than carrying the sort of fat that Telecom has for years. AOTC will gradually shed those installation and maintenance roles, but it cannot do so at the moment because of political and union constraints."

Manufacturing in China?

On the export front, Exicom sees China as its main springboard into the Asian region, and extensive and delicate negotiations have continued over the past few months, led by CEO, Bob Cruickshanks, also Chairman of Olex Cables, who has spearheaded Olex's penetration of the Chinese market.

Cruickshanks said Exicom would make an announcement on its China plans some time in the first half of this year, stressing the sensitivity of the negotiations. However, Exicom does appear to have accepted a Chinese pre-condition to market entry, of establishing some kind of manufacturing presence in China. This could see some of the functions of its manufacturing base at Villawood in Sydney gradually transferred to China, according to Exicom Chairman, Barry Capp.

The most likely first step into China appears to be a joint venture with a Chinese power supply manufacturing operation in the Chinese province of Dongguan, involving Exicom telephone exchange power equipment. While shipments of these power units from Villawood to China have already commenced, negotiations are still proceeding on a timetable for part or full manufacture in Dongguan.

In the Middle East, most of Exicom's sales to date have been to the Arab Emirates with further significant orders expected.

According to Cruickshanks: "Like everyone else in the Australian IT industry, we must push for exports. Any company that wants to be alive next year or the year after must look to expand in overseas markets."

The export drive has been made all the more critical by a revenue decline which has seen the company sell off its US operation, Exicom Technologies, which had racked up losses of $4 million, and shut down offices in Taiwan and Dusseldorf in Germany. Exicom's infrastructure now consists of the Villawood factory, its administrative headquarters in Melbourne, its service operation at Springvale in Melbourne, a factory in New Zealand and offices in Hong Kong.

While the aim of the overseas rationalisation was to focus on the core business in Australia and New Zealand as a staging ground for further penetration of the Asia-Pacific market, the company has also been forced to shed 110 production and professional staff locally. And while sales were up 10% to $133 million in 1991-92, in the first

Continued on page 26

EDI

Telecom Plus Practices Under Fire

Shrinkage is not a word traditionally regarded with much fondness within AOTC. But whatever the Trade Practices Commission (TPC) rules on allegations by National Electronic Interchange Services (NEIS) of unreasonable and predatory behaviour by Telecom Plus can only force AOTC to reassess the way it has previously shuffled the cards, and the chips, within its enormous and complex structure. With a TPC decision on the case expected early this month, industry observers believe the real issue for AOTC is a return to its core business.

By forcing Telecom Plus to come clean in its accounting processes and referring the NEIS allegations to the TPC, Austel has helped confirm its worth, at the very least for insisting that AOTC determine just how much money it was losing on its EDI operations, and for how long, under the Chart of Accounts and Cost Allocation Manual.

Faced with an inevitable decline in market share from here on in, AOTC has demonstrated that it is prepared to take Austel's directives on the chin, if not exactly shrugging them off. Telemart was shut down in August last year, two months after a directive from Austel which followed allegations of cross-subsidisation by the Australian Direct Marketing Association. The more recent Austel directive on Telecom Plus' EDI operations has again concentrated the VAS/VAN management's minds on the financial viability of its services.

Asked what fall-out he expected from any TPC ruling on the NEIS complaints, Telecom Plus General Manager, David Rolls said: "Virtually nothing." He doubted that there would be any penalty. "There's nothing Austel has told us that we aren't doing already. We don't believe there's an issue here. What Austel really wants is to see a trend to profitability."

"Our EDI operation is now back in reasonable shape and on its way to profitability. We made some projections for the 1992-93 financial year and we are already $4 million ahead of those projections. By the end of June, we expect to be profitable on a month-to-month basis." His projections were based on established markets in the motor industry, the retail sector, the telecommunications arena and among State and local governments, the latter including the Victorian and West Australian Governments and such authorities as the Brisbane County Council.

Profiling a leaner and more efficient Telecom Plus, Rolls said staff numbers had fallen from some 375 a year ago to the present 240 — around half directly involved

Continued on page 26

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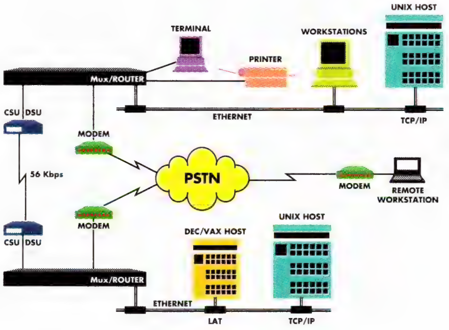

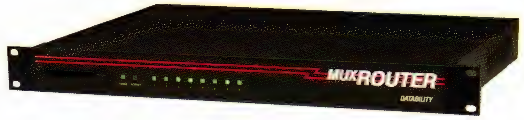

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International Communications

What Price Leased Line Reliability?

Digital leased lines have delivered to international private networks just about everything promised by the PTTs and carriers that supply them — everything it seems that is, except for reliability.

PTTs measure reliability in terms of availability — the percentage of total time that a circuit of facility is operational. According to CCITT recommendations, downtime should not exceed three hours of downtime per month on continental circuits (an availability rate of 99.6%) or 1 hour per month on intercontinental circuits. But even this figure is skewed to some extent. PTTs usually don't include planned outages for maintenance when they calculate availability and they also soften the effects of outages by using average annual figures.

One of the most extensive surveys of digital circuit reliability so far has come from the International Telecommunications User Group (Intug). Intug got some of its members with line-monitoring equipment to report all outages on international circuits during two periods, from December 1990 through February 1991 and from December 1991 through February 1992. Tony Cornish, Deputy International Communications Manager for Reuters in London, who coordinated the surveys, says about 500 lines were monitored, but that analysis was confined to intra-European routes. The first survey involved 279 lines; the second 285 lines.

The more recent survey (Table 1) shows 64Kbps circuits — the most abundant circuit type in the survey, accounting for 100 of the 285 lines monitored — having an availability rate of 99.0%, a mark. The next most popular lines, 9.6Kbps circuits, fared even worse: The 54 9.6Kbps lines monitored logged an average availability of 98.5%, which means the average line was out of service nearly 11 hours each month.

But even Intug's figures may be slanted somewhat in the carriers' favour. For instance, a large proportion of the circuits had one end in the UK, reflecting the country's importance as a hub for international networks in Europe and the origin of the survey.

Intug says it avoids rating individual PTTs because international circuits are supplied by carriers at either end of the line, and it's often difficult to pin the responsibility for outages on one party. Nevertheless, its findings strongly imply that some PTTs are doing a better job than others. For instance, routes involving Germany's Deutsche Bundespost Telekom are in the bottom half of the availability ratings, while those involving Sweden's PTT, Swedish Telecom International, generally are in the top half — expect for its link with the German PTT.

HongkongBank's Scorecard

For the past three years, the Hong Kong-based Hongkong and Shanghai Banking Corporation has kept a log of all outages lasting two minutes or more on its global network (Table 2). Its findings are based on fewer circuits than the Intug survey, but they offer a clear picture of the reliability problems faced by users of digital leased lines.

The bank's findings are tempered by a number of factors. For instance, ratings for some carriers are based on the performance of a single circuit, which probably isn't representative of a carrier's overall performance. The way that the bank apportions blame for faults could also distort the picture; if neither carrier admits responsibility for an outage, the bank splits the downtime between the PTTs providing the circuit.

These qualifications aside, HongkongBank's data suggests that the key differentiator in PTT performance is not the frequency of outages, but the time it takes to restore circuits. According to the bank's figures, the number of failures per circuit in 1991 ranged from 29.3 for Japan's KDD to 53.5 for MCI. Yet the total downtime per circuit ranged from 2.6 hours for Hong Kong Telecom to 42.2 hours for the Swiss PTT.

The carriers rated by HongkongBank said that in general the bank's outage and downtime figures were accurate — although

Table 1: Comparing Circuit Availability

Circuit Speed (Kbps)	Percent Availability*
12	100
M.1020 (analogue voice-grade line)	100
768	99.99
384	99.94
1,544	99.94
1,024	99.90
128	99.88
1,984	99.88
512	99.87
2,048	99.56
64	99.03
14.4	98.87
56	98.78
19.2	98.76
9.6	98.54
16.8	98.48
256	97.00
4.8	96.08

** Availability is calculated by dividing the amount of reported downtime for each circuit by the total number of hours in the three-month period covered by the survey.*

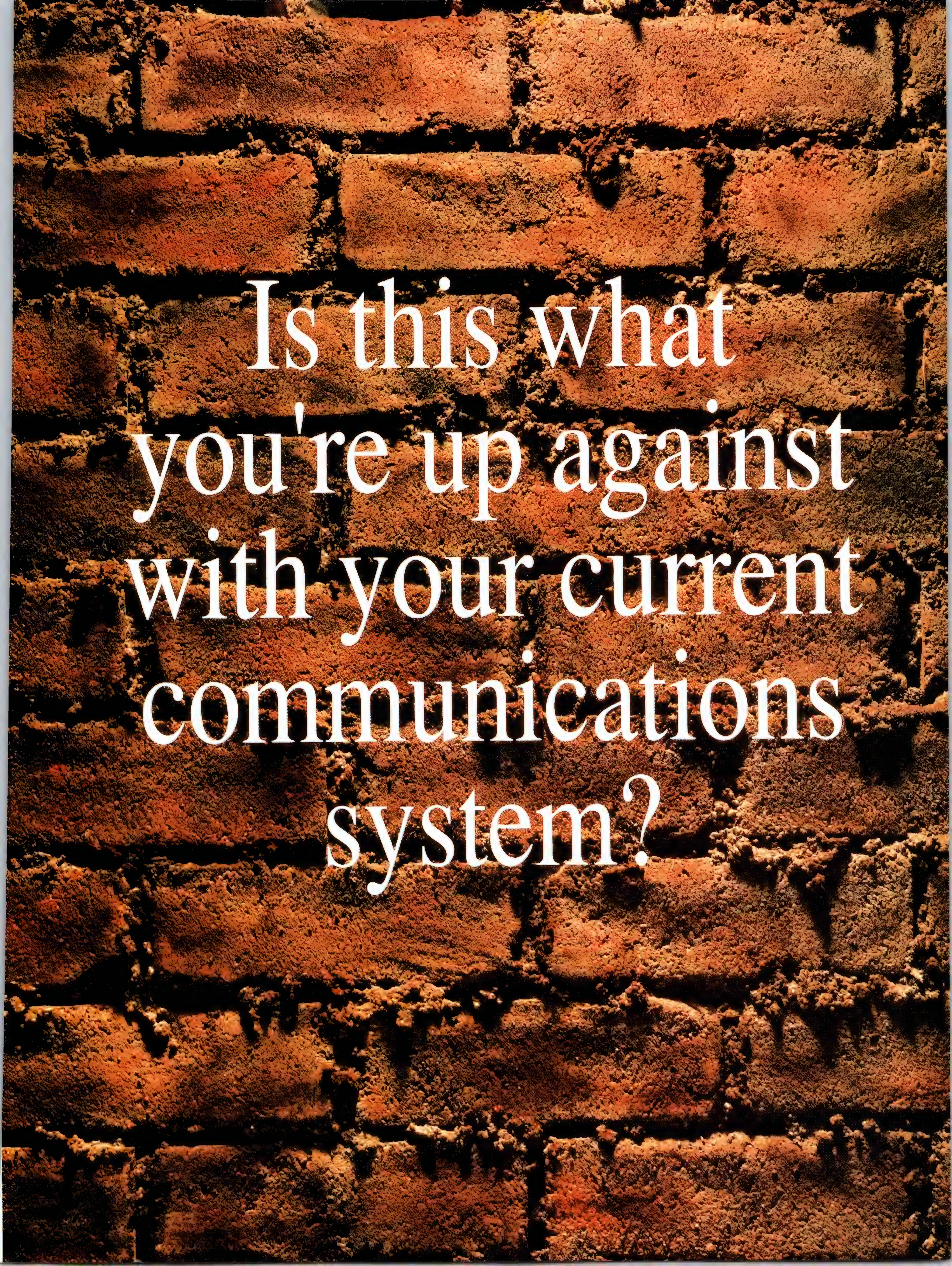
Figures reflect the performance of 285 intra-European circuits monitored by Intug members in the period December 1991 through February 1992.

Source: International Telecommunications User Group (Intug)

Table 2: HongkongBank's Downtime Scorecard

	Average Downtime Per Circuit (in hours)			Average Failures Per Circuit			Average Duration of Failures (in minutes)*		
Carrier	1989	1990	1991	1989	1990	1991	1989	1990	1991
AOTC	5.1	1.6	6.5	25	23	30	12.24	4.17	13.00
British Telecommunications (BT)	10.9	12.7	12	32	32.3	34.7	20.44	23.59	20.75
France Telecom	4.3	22.9	12.4	23	37	31	11.22	37.14	24.00
Hong Kong Telecommunications International	6.7	5.2	2.6	28.5	48.8	36.2	14.11	6.39	4.31
KDD	3.6	2.5	3.7	29	40.5	29.3	7.45	3.70	7.58
MCI Communications	8.6	17.7	15.5	30	51	53.5	17.20	20.82	17.38
Mercury Communications	4.2	5.9	5.8	14.5	40.2	37	17.38	8.81	9.41
Singapore Telecom	5.6	16.8	5.7	41	98	47	8.20	10.29	7.28
Swiss PTT	30.3	88.6	42.2	42	83	52	43.29	64.29	48.69
Teleglobe Canada	16.8	14.4	17.6	37	75	42	27.24	11.52	25.14

**Average duration is calculated by dividing downtime per circuit by number of failures per circuit.*
Source: Hongkong and Shanghai Banking Corp (HongkongBank)


Is this what you're up against with your current communications system?

they dispute some key conclusions drawn by the bank.

"[The figures] are in the right ballpark," says Andrew Mutch, Branch Manager for Private Networks and Data Communications at Hong Kong Telecom. KDD says that its data shows an average availability rate of 99.94% — the same rate reported by the bank. AOTC cites a slightly higher availability figure for its international digital circuits — 99.6% instead of the bank's 99.3% — probably because AOTC takes into account only those failures that clearly occur on its segment of international circuits.

But the carriers take issue in another key area: The relative reliability of digital and analogue leased lines. According to the bank's figures for 1991, the average mean time to repair failed digital links was 2.63 hours, compared with 2.28 hours for analogue circuits. Only one carrier — Hong Kong Telecom — agrees that digital circuits are less reliable than analogue lines. Other operators supply statistics that prove exactly the opposite. British Telecom says the minimum availability rate of its digital lines is 99.85%, compared with 99.78% minimum for its analogue lines. AOTC, which claims a 99.96% availability rate for its digital circuits, says its analogue lines have an availability rate of 99.95%.

The carriers cite a number of reasons for digital leased line failures, including cable breaks or satellite link failures — although HongkongBank estimates that only 13% of the failures in its network could be attributed to the transmission medium.

The complexity of digital networks is another major source of failure, carriers say. Synchronising and multiplexing signals at the international level is particularly tricky because carriers often use different signaling schemes, says Mutch.

Carriers also explain that there are 'black spots' in the world's networks, and that many international circuit failures are due to links in countries with unreliable facilities.

To overcome reliability problems some users are forcing carriers to do more about improving reliability by insisting that their carriers sign agreements, carriers incur hefty financial penalties if they don't meet pre-established availability goals. HongkongBank is negotiating service-level agreements with 12 digital carriers around the world.

Under the bank's service-level agreements, all outages of 30 minutes or more are totaled to give the overall downtime per circuit per month. If downtime per month exceeds three hours on any circuit, the bank earns the right to a 'rebate.' It can exercise this right at its discretion. The size of the rebate is tied to the total amount of downtime. BT and AOTC have now put in place standard service-level agreements that automatically credit rebates to a customer's account when monthly availability figures fall below a set target.

Anne-Marie Roussel

Exicom from page 22

quarter of the 1992-93 financial year it fell 7% short of budget predictions, impacting on projected profits.

On a more positive note, Exicom expects to lift profitability as a result of four events which occurred last year — its strategic alliance with NorTel, the acquisition of Melbourne-based J&R Communications, the spinning off of Exicom Communications Systems as a separate company and its successful $18.5 million share issue which took shareholders' funds to $42 million.

The NorTel alliance has seen Exicom install line-card circuit boards in Optus telephone exchanges to support NorTel equipment at those sites. Exicom says it will also be looking to increase its exports through the NorTel connection.

But Exicom's relatively lacklustre performance recently has surprised many observers, given the company's secure market and access to large-scale investment funds.

Managing Director of Hambros Telecommunications, Dr Chris Beare, said Exicom's revenue decline this financial year could be in part due to the deregulation of the telecommunications terminal market, and the fact that AOTC no longer has the monopoly right to provide a first telephone. This had probably also impacted negatively on Alcatel, which was the other major telephone terminal supplier to the old Telecom.

"Remember, Exicom built a large, sophisticated production line facility at Villawood to cope with forecast high terminal demand," he said.

Beare said that given the probable decline in demand, Exicom had been striving hard to replace the domestic market with export revenues and to decrease it dependence on AOTC. "We have seen some success is this area, but building an export market takes time to achieve," he said.

Bernard Levy is a freelance journalist based in Sydney.

Telecom Plus from page 22

in EDI, about the same number in messaging and between 20-30 working on X.400 and X.500 platform development.

Offering some explanation for the NEIS allegations and Austel's cross-subsidy findings, Rolls, who came to Telecom Plus from OTC just over a year ago, said the problem was that EDI had not taken off according to the predictions, and the industry was consequently intensely competitive. While EDI market predictions for 1992 were between $50-100 million, actual revenues were closer to $15 million. "Profitability and growth will eventually come, in Australia and worldwide, but it will come slowly," he said.

Describing Telecom's financial support for Telecom Plus' EDI operations as investment rather than cross-subsidisation, Rolls said the funds had been provided with the sole intention of "keeping EDI afloat until things got better," though he did "not have the visibility to see where the money came from within Telecom." Rolls added he did not believe there was an EDI company in the country that was making money; in fact they were all recording losses.

Specifically addressing the NEIS complaints over the EDI contract for retailer James McEwan & Co, which Telecom Plus eventually won in a three-way contest with GEIS and NEIS, Rolls said that while he was "here to make money," Telecom Plus had had "no intention of acting in a predatory way." What Telecom Plus had done, Rolls said, was to offer software, transaction processing and installation in one package at a fixed price. "We believed, rightly, that the fixed price would be more attractive and provide an incentive for the company to get an EDI hub going. But we certainly did not 'give' it to them."

According to Chris Zull, Austel's Network Access and Duopoly Analysis Manager, the authority had been obliged to act on the NEIS allegations under Section 37 of the *Telecommunications Act, 1991*, which relates to business practices damaging to competition. "The term 'competition' is not clearly defined under the Act, and there is a distinction between competition and a competitor. Damage to competition by and large means creating barriers to market entry or similar actions." In the McEwan case, Zull said, he and his project team had found that most of the local EDI companies operated in niche markets, sometimes dipping into the same markets. But Telecom Plus and NEIS were the larger general operators and more directly head-to-head in the broader market.

The TPC's Director of Telecommunications and Broadcasting, Terry Castles, told *Australian Communications* meetings had been held with all parties involved and the "fullest investigation" had been conducted.

Under injunction clauses and ancillary orders, companies or people suffering loss or damage could claim damages. Under 'specific performance' sections of the Act, a court might order a company to stop performing in a certain way, or perform in a different way. Courts also had the power to rescind contracts if these were deemed to be unfair.

"In competition complaints, we look at each individual case in terms of the market, the geography of the market, the substitutability of products and issues such as barriers to market entry," Castles said. "Section 46 of the *Trade Practices Act* prohibits misuse of market power, and several technical and legal assessments must be applied before such misuse can be proved."

Bernard Levy is a freelance journalist based in Sydney

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A Better Way.

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Beating the SNA Clock

Router vendors are scrambling for ways to avoid SNA session time-outs.

Organisations that combine SNA and LAN traffic on router internetworks are finding themselves caught up in an unnerving networking version of 'Beat the Clock.' Up to now, it's a game that no one has figured out how to win consistently. At issue are timing constraints imposed by SNA sessions. In essence, a network has 10 seconds to get SNA synchronous data link control (SDLC) traffic from a user's terminal to the host computer. If the traffic doesn't reach its destination in 10 seconds or less, the session is dropped unceremoniously in a time-out.

Time-outs usually are not a problem with conventional SNA networks, which carry SDLC traffic over dedicated links between cluster controllers and front-end processors. But when SDLC is run with other traffic over the same internetwork, it is subject to network congestion delays that can cause SNA time-outs. The root of the congestion problem is that bridges and routers are too democratic. They treat all traffic the same — no matter what its origin, the first frame in is the first frame out. To a router, it makes no difference if a frame is carrying the latest Test Cricket results or an electronic funds transfer involving millions of dollars. Because of this, a transfer of a large but inconsequential file between two workstations can clog the network and cause SNA session time-outs.

The congestion problem is compounded by the fact that most internetworks include relatively low speed wide area links. Two of the most prevalent protocols used in internetworks — NetBIOS and source route bridging (SRB) — use broadcast packets to find destination nodes, adding unnecessary traffic to the network. In addition, SNA is not constructed to handle the types of routing decisions required by internetworks; if a link in the internetwork goes down, SNA cannot re-route traffic to avoid time-outs.

Internetworking vendors now claim to offer a variety of ways to reduce congestion on internetworks and prioritise traffic to give SDLC first shot at bandwidth. Some strategies hold more promise than others, but none of them have been tested thoroughly enough to guarantee acceptable delivery of SDLC traffic. To add to the confusion, two networking architectures are now vying to replace SNA as a backbone protocol. One is IBM's Advanced Peer-to-Peer Networking (APPN); the other is Advanced Peer-to-Peer Internetworking (APPI), developed by Cisco Systems. APPN and APPI both offer dynamic re-routing to help SDLC traffic conform to internetworks, but they accomplish this feat in fundamentally different ways.

Four Roads

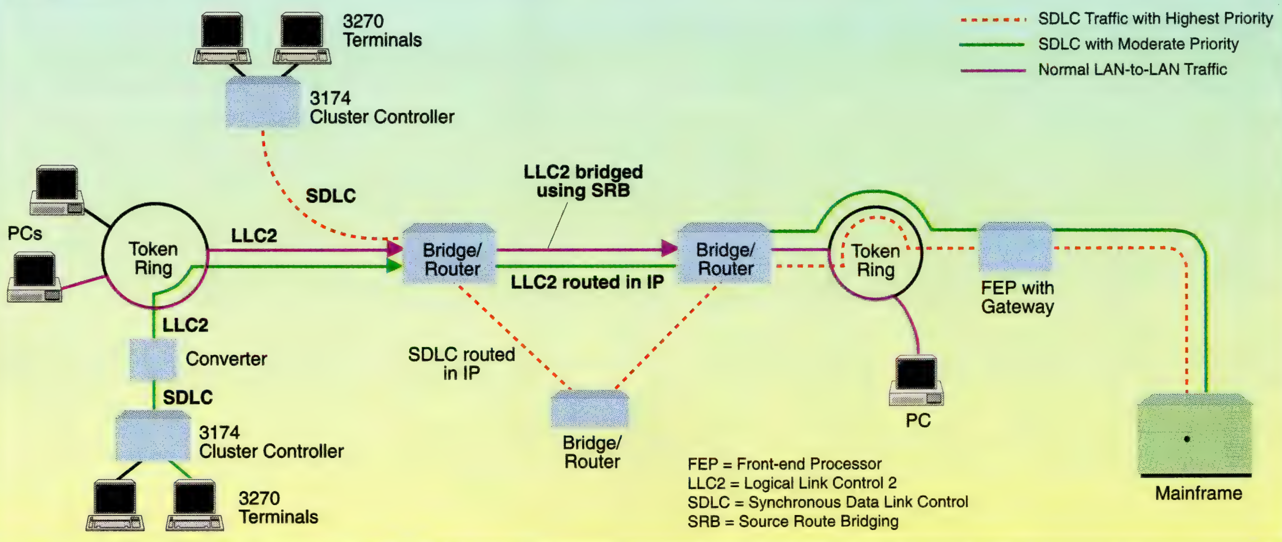
Four basic approaches now exist for handling SNA traffic on LAN internetworks. The simplest way is to equip a cluster controller with a Token Ring adaptor card and connect it to a Token Ring. Traffic is then sent via the SRB protocol over the network with other LAN traffic. A second method is to encapsulate SDLC traffic in IP packets for routing over the internetwork. This process, also known as tunnelling, is offered by almost all router vendors. A third approach involves converting SDLC traffic from cluster controllers to Logical Link Control 2 (LLC2) traffic. The LLC2 frames are sent over the internetwork and are directed to the host via an SNA gateway.

The fourth way to handle SNA traffic on LAN internetworks comes from bridge/router vendor Crosscomm (represented in Australia by Scitec) via its ILAN Universal Router and Protocol Independent Routing (PIR) software. Under Crosscomm's approach, SNA traffic is not encapsulated in IP packets. Instead, PIR takes SDLC packets from cluster controllers and NetBIOS packets from Token Ring LANs and adds media access control (MAC) address information to the front of each packet. Each ILAN has an Address Processor that reads this information and looks up destination addresses in a directory that contains information about every device on the internetwork.

Crosscomm also is taking a proprietary approach to two other internetworking issues: Giving SNA traffic priority over other traffic, and reducing traffic that can overburden internetworks, such as NetBIOS broad-

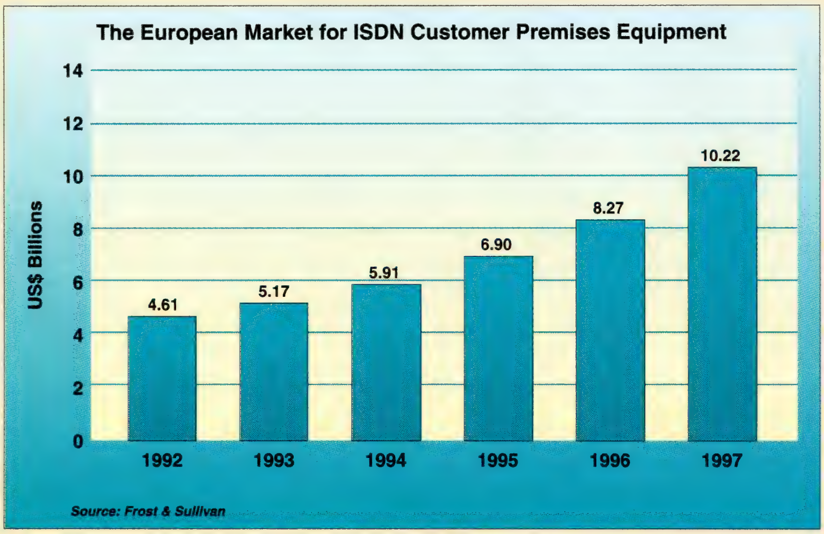
Getting Traffic Priorities in Order

Proprietary routing software packages from Crosscomm and Cisco Systems help prevent SNA session timeouts by giving higher priority to SDLC traffic.



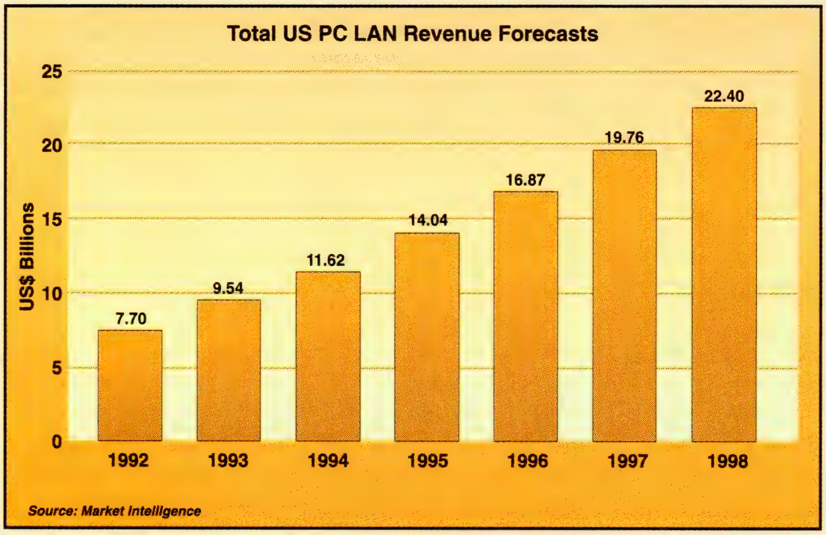
FEP = Front-end Processor
LLC2 = Logical Link Control 2
SDLC = Synchronous Data Link Control
SRB = Source Route Bridging

Market Watch



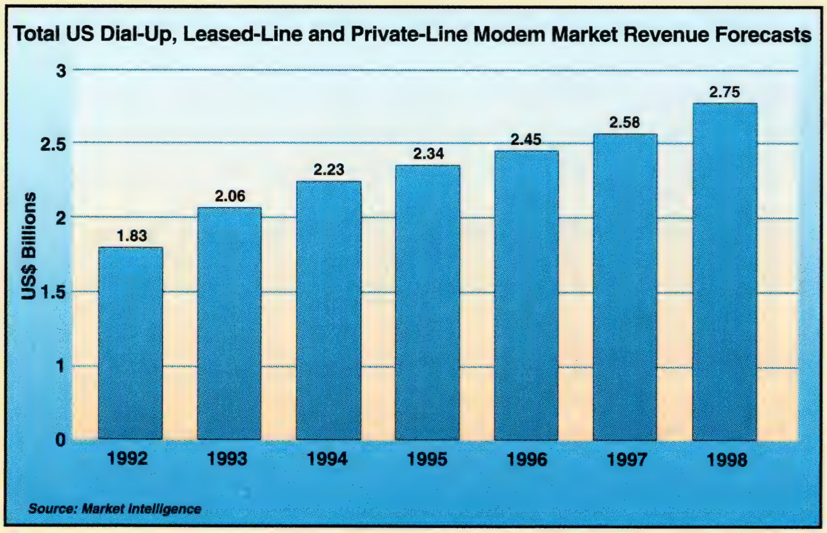
The European Market for ISDN Customer Premises Equipment

Source: Frost & Sullivan



Total US PC LAN Revenue Forecasts

Source: Market Intelligence



Total US Dial-Up, Leased-Line and Private-Line Modem Market Revenue Forecasts

Source: Market Intelligence

cast packets. In October last year, the vendor released an upgrade to its routing software that lets ILAN bridge/routers emulate some properties of an IBM Physical Unit 4 (PU4) node. PU4 nodes handle congestion control, transmission group management, and such SNA management services as traffic measurements in performance analysis.

With Crosscomm's software, net managers can use SNA Class of Service functions to set priority levels and transmission groups, predefining alternative paths between devices. Traffic can be prioritised based on a number of parameters, such as the destination address. For instance, traffic destined for a front-end processor can be given a higher priority and will be handled faster than packets destined for user workstations (see figure on page 29). Crosscomm's software goes a step further by allowing SNA traffic to be prioritised at three levels: Low, medium, and high priority. Levels are set by network managers and are based on the Class of Service defined for the route.

Also in October, Cisco began shipping new router software to handle prioritisation of SNA traffic. The new release comprises Phase 4 of Cisco's five-phase plan for SNA internetworking. Like Crosscomm's software, Cisco's upgrade offers some PU4-type functions. Cisco added SNA Class of Service functions and prioritisation based on SDLC and Logical Unit (LU) addresses. The SDLC address prioritisation lets managers assign higher priority to traffic coming from cluster controllers and also set different priorities for different end-users and end nodes.

To date, Crosscomm and Cisco are the only two internetworking vendors offering PU4 functions for routing SNA traffic. Proteon was scheduled to offer packet prioritisation by the end of 1992. 3Com says it will keep its prioritisation scheme on hold until it releases APPN-complaint products this year. 3Com also plans to roll out SDLC conversion and LLC2 tunneling over IP with an option to reduce traffic by terminating LLC2 sessions at remote sites. Wellfleet Communications says it will offer prioritisation based on any field in the packet, including source or destination address, source and destination pairs, and application.

Broadcast Woes

Making sure SNA traffic gets priority treatment from routers is only part of the congestion issue. Another part has to do with reducing the amount of extraneous traffic that traverses wide-area links in the internetwork. The main culprits when it comes to wasting internetwork bandwidth are NetBIOS and SRB. Both of these protocols use broadcast packets to find destinations. Their continuous generation of broadcast packets can overwhelm lower-bandwidth WAN links.

Vendors take different approaches to filtering out broadcast packets. IBM's new

Continued on page 40

Applications

How Qantek Keeps the Kangaroo Flying

Qantek's recent purchase of an Australia-North America T1 (1.54Mbps) link — the first commercial T1 out of Australia — constitutes the first significant pipe change to the company's backbone network since the early '80s, despite a threefold increase in traffic over the intervening decade.

Qantek (Qantas Airlines' IT subsidiary) operates one of the biggest private networks in Australia in terms of coverage, sites connected and traffic volumes. With an annual price tag of more than $20 million, this national and international voice and data network carries all of Qantas' reservations and general data traffic, supports the Australian traffic of several other airlines including Malaysian Airlines, Singapore Airlines and Air New Zealand, and the Australian-US traffic from 1,300 travel agents. The network was originally designed in 1982. Since then it has handled greatly increased demand without any infrastructure changes and will soon be expected to cope with the addition of Australian Airlines' traffic.

The purchase of the T1 link (supplied via OTC and AT&T's Skynet service) was essentially a reconfiguration and consolidation of several components of Qantek's international links. Dennis Cutrupi, planner of the original network and now Manager, Communications Services at Qantek, explains that the European traffic (through the London hub) has been aggregated with the North American traffic via a hub in Los Angeles, and shares the T1 satellite link to Australia.

"A major stimulus for the rerouting," says Cutrupi, "was the availability of optical fibre cable systems in the Northern Hemisphere. The fibre allowed Qantek to connect the London-Australia circuits via North America without impacting service levels."

Dropping the Sydney-London circuit and installing the T1 between Australia and North America has provided, claims Cutrupi, the same network coverage with increased capacity for no additional operational expense. The extra capacity will be used to provide additional international voice links that will realise savings of about $300,000 a year. It is this kind of network revamp through technology upgrades that has allowed Qantek to continue expanding services and volumes without changing its long-standing underlying carrier layer.

Integrating Voice and Data

In 1982, Qantas was one of the first Australian companies to plan a common transport layer for all voice and data. Recalls Cutrupi: "Basically we looked at the ISDN concept and investigated how we could implement and benefit from an ISDN environment when ISDN wasn't available."

Almost immediately Qantas realised cost benefits from voice/data integration. In those days the cost ratio of tie lines to 2Mbps trunks was about 13 to one. That is, if you had more than 13 tie lines you could cost justify a 2Mbps link. "So," says Cutrupi, "we built the carrier layer to support PABXs and replaced all the tie lines, integrating them into a 2Mbps link with Qantas' data needs. Basically, from 1984, interstate data was 'free' because the additional capacity was used for data connections."

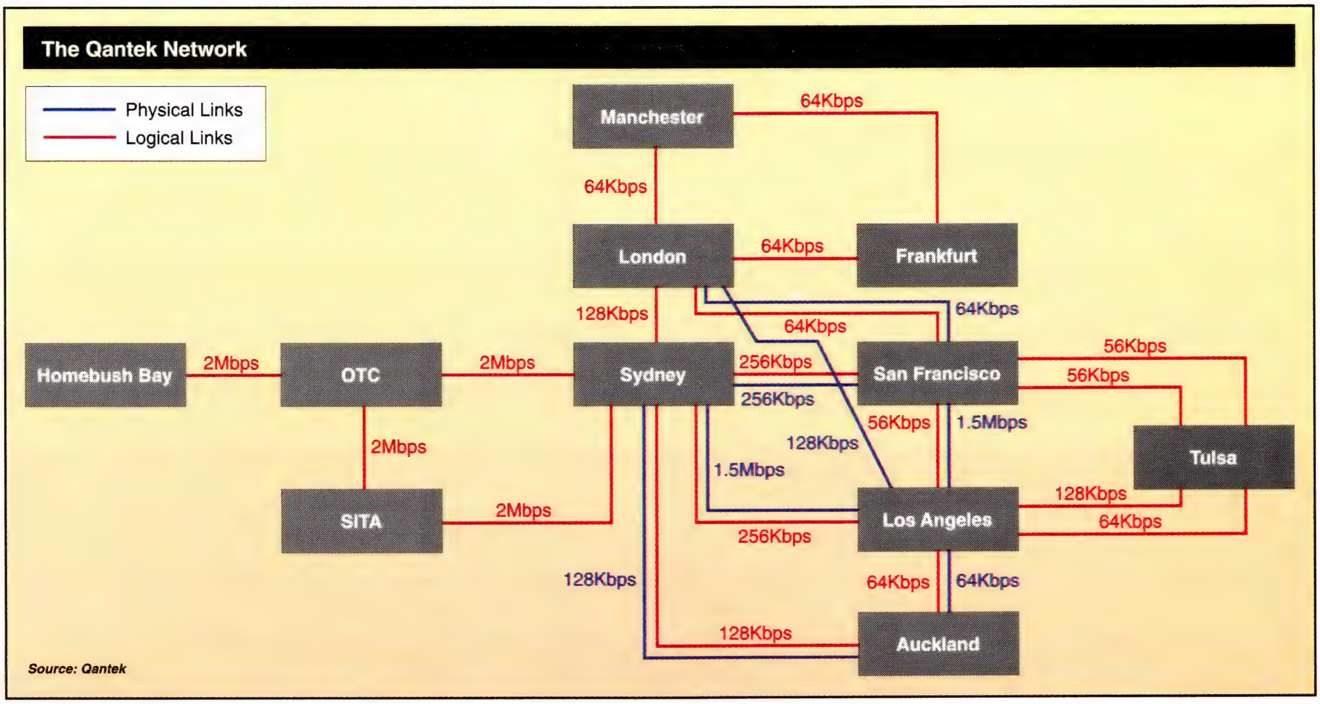
The carrier network in Australia consists of 14 Telecom Megalinks and 17 private microwave systems. The backbone network connects Qantas mainframe computers to the airports, sales offices and to Telecom facilities. The microwave systems, alternatives to land-lines, provide the higher network reliability required to meet Qantek's charter of 99.9% availability on all technology platforms (Telecom only guarantees 99.5% on its land-lines). "The use of triangulation and microwave radio systems is how we achieve that objective," stated Cutrupi.

The core carrier layer, which has 27 NEC 2400 PABXs and three ACDs (automatic call distributors), is now driven by, "at last count," 54 Scitec Maxima time division multiplexers. It supports all interactive reservations traffic and the Airline's general data requirements (7,000 visual display terminals). In addition to central mainframe access, the network supports many Unix and DEC distributed platforms. On the voice side there are 9,000 telephone extensions in Australia. The international component supports Qantas offices and general sales agents in 80 countries.

By 1989, when data traffic was on the increase but still only minimal compared to voice, the network was beginning to saturate. To more efficiently manage the data flow and, therefore, bandwidth, Qantek grafted X.25 switches to the carrier layer. NorTel DPN100 packet switching nodes were installed in each Australian capital city, London and Los Angeles to make better use of bandwidth and to control data flow from the computer systems.

The airline's LAN environment is superimposed onto the back of the X.25 network. (A typical node at any of the 54 locations would, says Cutrupi, have a high speed trunk terminating through a Maxima TDM with

The Qantek Network



Source: Qantek

links to a PABX and the X.25 switch.) The 70-plus Ethernet and Token Ring LANs around Australia are based on Novell NetWare 3.11. Right now the company is moving to consolidate all LANs into one logical LAN by using Cisco Systems routers and SynOptics hubs in each location.

With the concomitant migration to a single terminal (PC) platform (some overseas locations are currently accessing applications via a dumb terminals) a user, from any desktop organisation-wide, may get to any file server, gateway, print server, or host application.

And, as Cutrupi points out, this relatively complex environment sits on a basic carrier layer "built in the early days." Bandwidth can be dynamically changed to meet business demands. Cutrupi explains that, for example, "if there is a requirement to transfer a large file to Los Angeles, the whole T1 could be made available for the transfer and then reconfigured to suit normal day-to-day operations."

Similarly with voice traffic. When Qantas gained permission to begin flying on domestic routes, voice traffic increased by 70% causing the Melbourne-Sydney link to overflow to the public switched network. Voice traffic over this leg was subsequently compressed from 64Kbps to 32Kbps to double capacity and, with any further incremental increase in traffic, it can be further compressed to 16Kbps — as it is on the international links — without loss of quality.

There are just 14 people — 10 in Sydney, two in San Francisco and two in London — involved in planning, designing and implementing the entire network. A further 20, on 24-hour shifts, staff the network control centre housed in the central computer centre in Sydney.

The local area network environment is managed by SynOptics LattisNet Manager 3000 running on Unix: Another Unix workstation looks after the front-end processing. Qantek is in the process of evaluating Scitec's new console product, InSight, and also other network management products for integrated management of the voice and data networks.

Built to Last

Interestingly, although Qantas' backbone network was planned around the concept of ISDN — integrated voice and data — Cutrupi believes ISDN itself will be only be of use in the near future, in this particular network, to provide redundancy and overflow capacity.

"In our environment everything has to be online 24 hours a day. The cost of connecting ISDN is time driven, so it is more economical to use leased services. If you run a business where you use capacity on demand (on the voice side breakeven connect time is around the four-minute per call) then ISDN comes into its own."

Shelley Spriggs

Voice Recognition

Trading on Speech Patterns

It's one of the worries about our modern economic culture that the least productive of all business enterprises seem to gain the most from modern information technologies — both with computers and communications.

Three-quarters of the world's 'theoretical trade' is now entirely artificial and carried on electronically — mainly trading in currencies. Australia's GDP increasingly reflects the dominance of speculation over substance. According to Prime Minister, Paul Keating, 27 of every 28 international exchange deals are now for non-tangible (speculative) purposes.

Last year, on 29 April 1992, 50,000 contracts passed through the Sydney Futures Exchange (SFE) in five minutes, and these had an accumulated value of more than $7 billion. This represented more commercial value than the Australian coal industry earned in its most recent full financial year.

So these days it is the non-productive industries which have the profitability and the cash-flow to first absorb the latest and best of information technologies. And a good example of Australia's economic 'progress' (if that is the right word!) in high technology use is to be found in the Sydney Futures Exchange's new Voice Reporter — a highly sophisticated voice-activated exchange-dealing system being developed by Applied Financial Services (AFS), a Melbourne-based firm. It continues a tradition established by the invention of the totaliser for Australian race-courses many years ago.

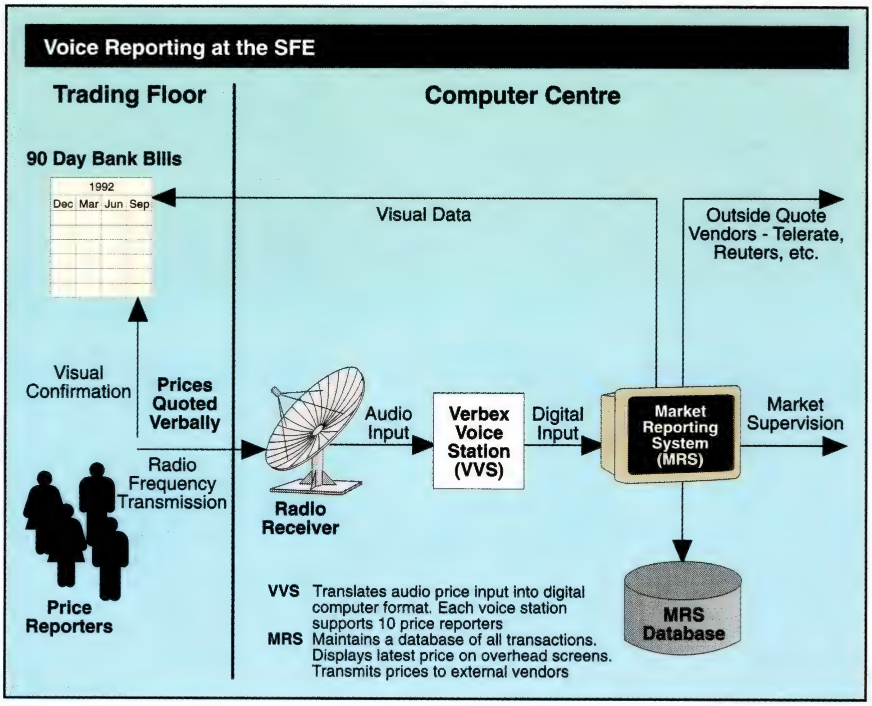
With Voice Reporter, dealers will soon be able to gamble their way to personal prosperity without human intervention, using the latest in electronic support. But fortunately for our external balance of payments, AFS appear to be on the verge of selling the system overseas — so some good may come of it yet. Exchanges in Chicago, London, Paris and in Asia are already negotiating to buy the system.

AFS has taken the Verbex voice-recognition hardware, originally designed by international oil giant, Exxon, and they've developed it (together with specially written software) to create Voice Reporter and Voice Trader. Control of the Verbex hardware was shed by Exxon in a US anti-trust suit and it was taken up by a venture capital group centred on the Carnegie-Mellon University. Now a number of computer companies, including IBM, have a share.

The key to the success of the technology is that it is capable of recognising continuous speech, male and female, with various accents (even languages) under stress conditions, and in a noisy environment. This noise cancellation is performed partly in the digital computer software/hardware combination, and partly in the analogue radio/microphone link.

In the $1 million Sydney Futures Exchange installation AFS will be using the existing Sennheisser-supplied radio microphone/transmission system to allow dealers in the pits to trade directly with the main exchange computer. The system is designed to take advantage of past expenditure on the two-way radio links currently being used to contact manual keyboard-entry operators. These wireless transmitter-receiver links cost about $15,000 each according to Stewart Evans of AFS.

Voice Reporting at the SFE



VVS Translates audio price input into digital computer format. Each voice station supports 10 price reporters

MRS Maintains a database of all transactions. Displays latest price on overhead screens. Transmits prices to external vendors

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The price reporter in the trading pits makes a decision and speaks the details into his/her radio microphone which transmits the information over VHF to the computer centre located a couple of floors away. Here a voice-station translates the audio information into digital text for the Market Reporting System, which, after instantaneous processing, updates the trades database (and the trading screens on the trading floor) and informs the Quote Vendors of the latest price for global distribution.

The exchange estimates that this direct-entry system can save the price of the installation within two years by cutting out the role of manual operators; and at 95% accuracy, the voice recognition system is faster, better and more reliable than manual entry they say. Tests at the average noise level in the pits (105 decibels) have shown that accuracy levels can still be maintained at 95% and above.

This is a one-way audio system using voice recognition only. The correct interpretation of the deal is confirmed on a display screen above the trading pit (see the figure on page 32), and corrections can be made immediately if the Verbex cards have mistranslated the quote. The system includes filters which will reject any quotes mis-read which are out-of-market range.

The voice-stations are racks holding 12 Verbex cards each with its own 80286 processor, and sharing a common hard disk. These stations output text through the SFE's X.25 network to the host.

The interpretation possible in these systems depends on the memory available, the speed of the processing, the quality of the algorithms, and the amount of training. Verbex is said to be capable of handling up to 20,000 words in its pattern-matching dictionary, and it has a rules-based grammar interpreter which also increases the likelihood of correct 'strikes.' In the SFE installation, a much smaller number of dictionary terms is used because of the limited range of words required. Even so, the process involved in training the card dictionary is relatively laborious.

By both limiting the vocabulary and partitioning the dictionary according to the 'pit' being worked, almost real-time processing of relatively complex (but nevertheless predictable) continuous sentences has been achieved. On entering the '10-year Bond' pit, for instance, the reporter will nominate this to the interpreter, which will then load only the terminology applicable to that pit. The card doesn't then need to search a second dictionary with words useful only in the '90-day Bank Bill' pit.

"The whole aim is to make a system which is reasonably intuitive," says Evans. "This is the way people work, and so we've made our system conform to standard work patterns." The Chief Executive of the SFE, Les Hoskin, says the system is also likely to be much better for monitoring purposes and for regulatory controls.

DEC was involved in some early development of Voice Trader, and the company took it to a Chicago international conference on technology for financial markets (SIBOS), running on a platform of DEC workstations. The Australian-produced television program *Beyond 2000* later picked up the story and spread the message around the world, raising considerable interest in financial markets.

But according to Evans, DEC is no longer involved and the system is reportedly currently being implemented at the SFE with a new version of the software handling price information running on Compaq hardware. The new version will handle daily trading levels of 'more than 100,000 contracts a day' — which is still below the April 29 extraordinary peak of 150,000 in the one day — but it seems generally adequate for an annual turnover of 18 million contracts.

Continued on page 40

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Video-on-demand (VOD) over existing copper phone wire is being trialled at the moment in the US. The technology was developed by Bellcore and Bell Northern Research, a research and development organisation of Northern Telecom.

The experimental VOD is based on transmission technologies such as high-bit-rate subscriber line (HDSL) and asymmetrical digital subscriber line (ADSL). Working with ADSL, Bellcore researchers have increased the information carrying capacity of phone line 100 times, giving viewers VCR-like quality over today's copper telephone line. (See 'Copper on the Beat?,' *Australian Communications*, November 1992, for a fuller description of HDSL and ADSL.)

"With video on demand viewers will make push button video calls using their remote controls to order a program, receive it through their home telephone lines, and still have the VCR-like features such as pause, rewind, fast forward, and visual searching," said Lanny Smoot, co-inventor of VOD at Bellcore. "And you also be able to talk on the phone at the same time."

At the experimental demonstration at Bellcore, the videos were sent on the phone lines using two digital signal processing techniques to compress video signal for transmission and storage by removing redundant information.

There are three major components of the experimental systems. The first is an information warehouse where the video material such as movies, music videos, documentaries and sports highlights are stored digitally in a compressed form. The information warehouse is then connected by fibre optic lines to service circuits in the local telephone company switching office. Video segments of 5-10 second durations are then sent to the viewers over copper telephone lines connected to the equipment in the viewer's home.

The third portion of the system is located in the customer's home. There a user network interface provides the customer with control and converts the compressed digital video signal to analogue for viewing. The VOD system also allows an unlimited number of subscribers to view the same program simultaneously. In the future, the VOD system could provide information menus, billing and scheduling. These features and functions — supported by the signalling and transmission capabilities of the network — would give subscribers even more control and access to program, said Smoot.

Research is also exploring enhancements of the architecture to support new two-way interactive services like network video games and video mail.

Video transmission may allow US phone companies to gain a competitive edge and increase the traffic on their networks. So far they have been barred from owning cable systems within their territories. But recently, the FCC ruled that RBOCs could provide a 'video dial tone' service to carry video programs on their networks for others. However, the phone companies are limited to only owning 5% of the total programming distribution business.

Bell Atlantic was the first RBOC to jump on the idea of supplying video to home viewers. Officials said it would begin to test the system this year. The company added that it plans to offer the service by 1994.

Mike Moeller

hub, a *hub*, and a **hub.**

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Standards

Should Standards be On-line and Free?

A group of US engineers want ANSI, the American National Standards Institute, to change its policies and make standards information available free of charge and accessible on-line.

About 500 engineers late last year signed a petition urging ANSI to review its distribution policies. The drive was headed by Carl Malamud, an author of networking books and independent consultant. Although the petition stressed the engineers wanted the standards information free, Malamud admits this may be impractical and a small fee could be required to obtain the documents over the Internet. "Free is nice, but there is no free lunch," he admits.

ANSI says it is now looking into the engineers' appeals. "Being on-line is one thing but someone has to pay for the development of these standards," said Marilyn Hernandez, a spokesperson for ANSI.

There are hidden costs in developing standards, she said. ANSI volunteers face travel and hotel expenses, the administration of the various standards committees, and the volunteered time an individual or corporation puts in debating technical issues.

However, Malamud has correctly identified a real problem, says Maris Graube, a former Chairman of the IEEE 802 committee and President of Relcom, a telecommunications firm. "The distribution of standards is a real issue," he said.

Much of that issue also involves who controls the standards at the global level, Graube said. European governments often finance their standards development so that companies can easily take advantage of this, but in the US all the development is done by volunteers. Major corporations such as IBM, DEC and HP contribute money to aid standards development, but this financial support is not enough. ANSI could cut its international standards budget, but this may cause the US to lose impact in global competition. "The technology moves fast and you can't wait around for a long time for papers to be written and published," he said. "It's really a power play of which country controls which standards."

According to Malmud, standards would be able to be set in place much faster if the information concerning them is easily and freely available. "The best way to build consensus is to get that information out there," he said. But even though free availability of standards is unlikely, the distribution of this information on-line is a definite possibility which ANSI is examining.

But the organization might be reluctant to go on-line because funding coming from selling standards documents equals 30 to 40% of ANSI revenues.

For example, some standards documents cost $US10 a page and are sometimes thousands of pages long, preventing all but the wealthy to gain access to these standards. Malamud believes that ANSI could still make money through on-line distribution. It can generate revenues by selling the documents for less but to a larger market. It can also probably sell more if it gave users a taste of what the standards document is like on-line, and then sell them the paper version.

Malamud is hopeful that ANSI volunteers will help to turn the situation around, and that a change of policy in free-of-charge and on-line distribution will come from its corporate backbone. But the ANSI secretariat level will have to change its attitude before this is possible. "ANSI believes that the standards are only for those who are materially concerned, and that I believe is dead wrong," Malamud said. "It's in their own self-interest to get these out."

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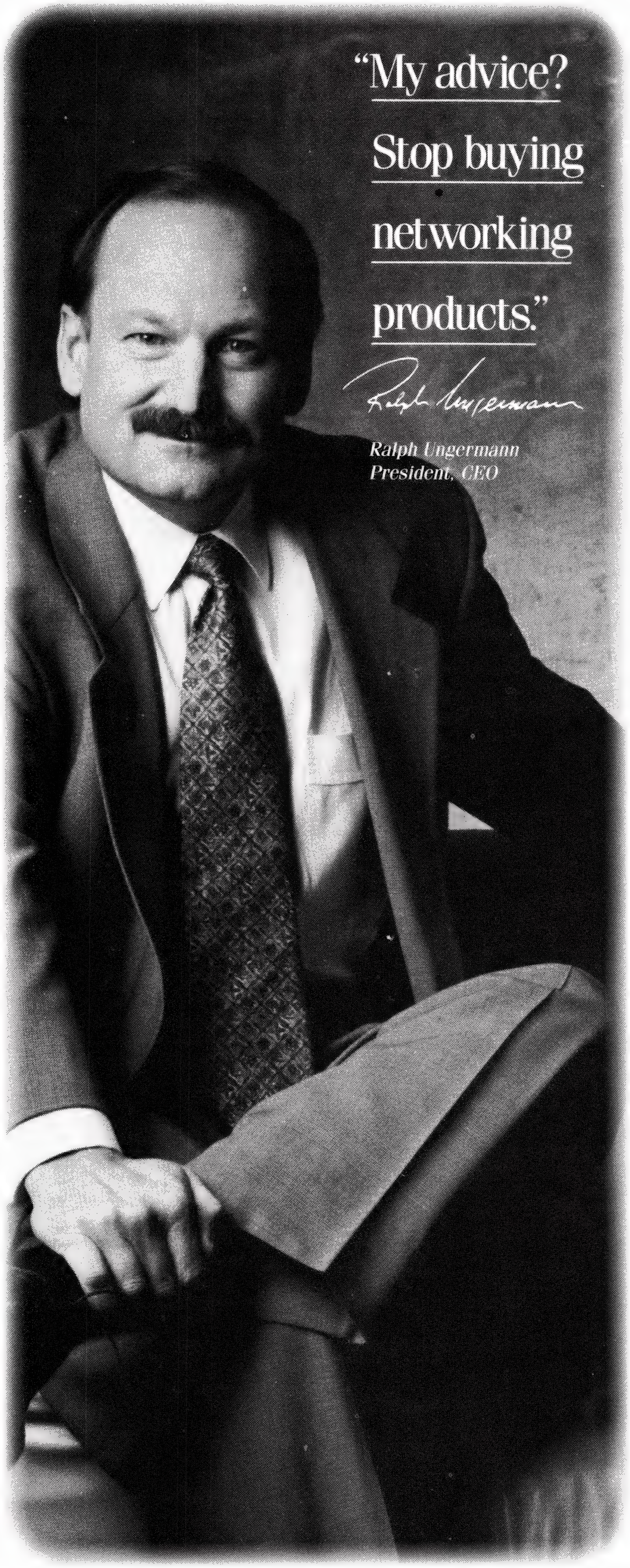

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Applications

WorkCover Makes Moving Easy

After several months of planning, the NSW WorkCover Authority undertook over one weekend a massive relocation to its new headquarters in central Sydney, installing along the way almost 500 workstations, a dozen SynOptics 3000 Series intelligent hubs and various routers, 10 Novell-based servers, a Unix server, and a mixed bag of peripherals.

Much of the preparation, including the testing and configuration of the Authority's SynOptics 3000 Series hubs, took place in the weeks leading up to the move at networking specialist, Com Tech Communication's technical lab in Sydney. "We couldn't possibly estimate the value to WorkCover of Com Tech's assistance in the lab, but from a production point of view we had 80 to 90% of our full capacity operational after that first weekend," said Paul Camillos, a contractor working with WorkCover who along with colleague, Richard Limbrick, coordinated and planned the project with Com Tech.

WorkCover, the NSW Government body responsible for the administration of workers compensation, made the decision in 1990 to centralise its office space, moving out of its headquarters in Rosebery and several smaller sites around Sydney.

As part of the move, WorkCover began using Novell's NetWare for SAA to link into its bureau-based mainframe, enabling it to rid itself of dumb terminals, three IBM 3174 controllers and a host of mainframe terminal emulation boards previously installed in PCs accessing the mainframe.

WorkCover's offices now fill 12 floors over which the Ethernet network is split into six segments (each covering two floors a piece), containing 11 SynOptics intelligent hubs, linked via 10Base-T cabling with a fibre optic backbone.

Applications now running on the system include WordPerfect, Lotus 1-2-3, Q&A, Excel and Quattro, running under either DOS or Windows. WorkCover has also developed a number of applications in-house, including one which is used by WorkCover's Risk Management Division for tracking hazardous goods. Other applications developed in-house keep track of workers compensation pay outs, workers compensation legislation, and health and safety legislation.

"The size and complexity of the WorkCover site makes it very special," said Charles Tym, Managing Director of ComputerLand Bankstown, the reseller involved in the WorkCover contract with Com Tech. "The fact it uses so many different types of product, from NetWare for SAA, GARP, TCP/IP, Novell's LAN Workplace for DOS and NetWare, is quite significant. When WorkCover began looking at its network needs, it had something like seven different LANs at the old site."

"It was due largely to the fact that the new building was able to be wired and cabled to WorkCover's specifications, that they could afford to take such a fresh approach to their network needs," said Tym.

Camillos said the consolidation of the LANs and the various technology was fairly straightforward. "We sourced the majority of our technology from Novell and that meant that the integration of the products wasn't up to us. The manufacturer had already done that for us."

Darren Edwards

Technology Update

HP and AT&T Propose 100Mbps Ethernet Standard

Hewlett-Packard and AT&T Microelectronics have joined in the race to develop a technology standard for a 100Mbps Ethernet. As reported in last month's *Technology Update*, four vendors, 3Com, SynOptics, Sun and LAN Media have spelled out a set of technical objectives to an IEEE 802.3 committee which they believe are necessary for a 100Mbps Ethernet standard over unshielded twisted pair wiring. Now HP and AT&T have put forward a proposal based on standard office cable, known as voice-grade cable. Supporting a star topology with intelligent hubs or concentrators managing individual connections to each desktop, the HP/AT&T proposed 100Base-VG standard relies on two technology advances — Quartet Signalling and the Demand Priority Access Method (DPAM). HP says Quartet Signalling uses all four pairs of wires in a 10Base-T cable rather than the two pairs used in the original 10Base-T approach. Consequently, it can deliver increased throughput while using 'essentially the same' frequencies as 10Base-T Ethernet. DPAM shifts the network access function from network nodes into an intelligent hub and eliminates the need for an end node to receive at the same time as it transmits, thereby making it possible to use Quartet Signalling. With DPAM, a network node wishing to transmit a packet makes a request to an intelligent network hub and also requests a level of service, either normal or high priority. The hub then directs the transmitted packet on the fly to the appropriate destination.

Enhancing PPP For Improved Serial Access

After a few hitches, an enhanced version of the point-to-point protocol (PPP) is moving toward adoption as a standard way for internetworking devices to send data over serial links. The enhanced PPP is progressing through the standards-setting Internet Engineering Task Force, and a group of more than 25 vendors has successfully conducted a large-scale interoperability test of the new spec. The PPP spec was first proposed in 1990 as an improvement to the serial-line internet protocol (SLIP). But the earlier version suffered from several limitations, including poor timing mechanisms and difficulties in checking the accuracy of received data, and trouble in identifying devices. The revised spec addresses all these problems by monitoring line quality and specifying a way to automatically link any two points in a network. The new PPP also checks the accuracy of routed data and automatically identifies the network devices being connected. There are three main areas covered by the new spec. First, it uses high level data link control (HDLC) to encapsulate data from multiple links. Second, it uses link control protocol (LCP) to establish, configure, and test data link connections. Third, it defines a group of network control protocols (NCPs) for establishing and configuring different network-layer protocols. Unlike SLIP, which only supports IP, PPP is protocol-independent and thus can be used with multiple networking protocols. PPP also handles more of the setup and handshaking than SLIP when establishing sessions.

Opening Windows to Desktop Management

Microsoft is adding SNMP-based desktop management capabilities to its forthcoming Windows NT operating system, according to US-based Netmanage, which is supplying Microsoft with APIs to help develop some of these features. Netmanage's software, called WinSNMP, allows multiple SNMP agents to reside on one PC — allowing management applications to monitor the PC's operating system, applications, peripherals, storage, and other components. Each of the multiple, or 'extensible,' SNMP agents registers itself as a Windows application on the PC. Until now, only Hewlett-Packard has offered a commercially available extensible SNMP agent, and that is for Unix systems; no other vendor of SNMP-over-TCP/IP protocol stacks for Windows has offered an extensible SNMP agent except Netmanage. Other vendors of SNMP software for Windows include FTP Software and IBM.

Wellfleet Announces ATM Strategy

The asynchronous transfer mode (ATM) bandwagon continues to roll with high-end router manufacturer, Wellfleet Communications, the latest networking vendor to announce an implementation strategy. Wellfleet's three phrase strategy is to first, provide an ATM interface for routers running at DS3 speeds of 45Mbps; second, provide an interface for speeds of up to 155Mbps; and third, incorporate ATM switching architectures into its Backbone Node router. The first phase of the strategy will be implemented this year.

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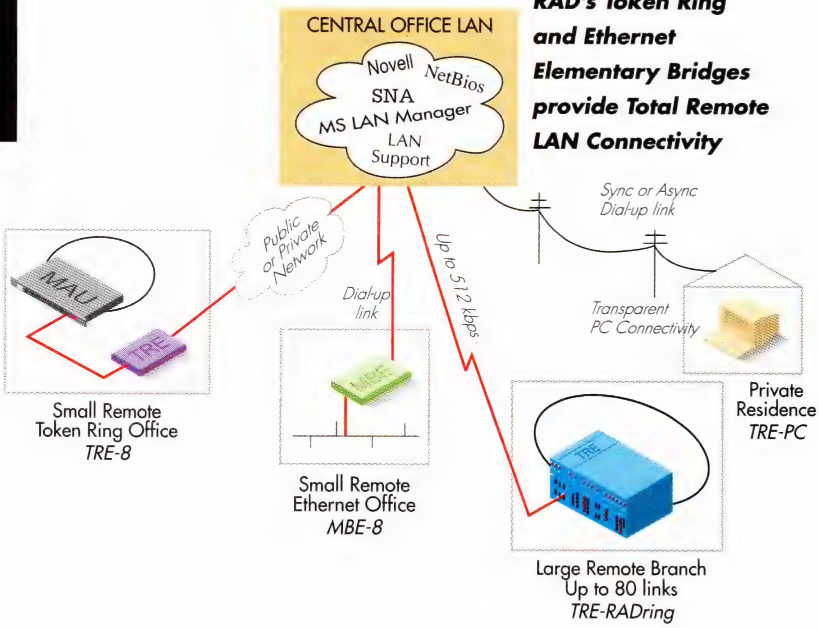

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Voice Recognition from page 34

Apple's Progress

It is noticeable in the last few months that there's been a sudden surge of interest in voice recognition and voice-synthesis techniques, closely paralleling the flurry of activity around pen-based computing I/O (and the expected arrival of cursive writing recognition) earlier in the year. The development of digital signal processing (DSP), ASICs, and RISC processing chips seem to be the driving force behind this appearance of recognition technologies, and the motivation derives from small portable computers and communications devices like Apple's new Personal Digital Assistants (PDAs) which are too small to provide a full-size keyboard.

A small travelling Cupertino circus was in town last December showing Apple's pre-release version of Caspar, its voice-recognition/voice-synthesis system for computer control which has long been promised. Caspar also uses continuous-speech recognition to allow natural, fluent speech input of commands — but full text recognition is still many years away, they say. Apple won't quote a release date for Caspar, but it must be close.

It is interesting to note, that at the lower end of the scale, speaker-dependent recognition (one user only) has now been replaced by speaker-adaptive and speaker-independent techniques, and that isolated words have now been replaced by continuous speech. By incorporating rules of grammar, the strict order of words has been replaced by more 'conversational' variety in the command phrases.

Apple's demonstration videotape of Caspar in action revealed that it is a full speaker-independent system which lets anyone use it without specific 'training.' It handled female and male voices equally well (turn-about, without retraining), and it only occasionally required a repeat of the command to work.

Caspar has adapted the old 'Simon-says' game to distinguish commands from casual conversation. You must say 'Caspar; open file 'Recognition'' and 'Caspar; show me the spreadsheet 'Annual Profits'' which are slightly unnatural speech patterns, but understandable in the context.

It is also noticeable that, like cursive writing input, speech recognition is now being wound-back in expectations to a more realistic level. It is no longer seen as a keyboard-substitute for computer-phobes, but rather as a supplementary system for small portable devices where table-top keyboard entry is not possible or practical.

So these techniques now appear to be capable of filling the gap at the juncture of computing and communications, and of providing us with a ready way to extend the usefulness of analogue voice telephony input into the digital computer world.

Stewart Fist

SNA from page 30

6611 multiprotocol router uses assigned surrogate IP addresses that correspond to Token Ring MAC addresses of LAN devices. Filtering is based on matching the MAC address to an IP destination; when broadcast packets are destined for a device attached to the same LAN, the router does not let those packets pass to the wide area link.

Cisco uses a technique that it calls 'NetBIOS name caching' to filter traffic. Each Cisco router maintains a cache of NetBIOS names, including designated names for users and devices, such as servers. When setting up a session between two NetBIOS addresses, the router uses the cache to find the Token Ring on which the destination station is located. It then sends a single broadcast message to that ring, instead of multiple messages polling the end-station.

Crosscomm has a similar approach with its routing software. ILAN bridge/routers build tables that associate each NetBIOS name with a MAC address and the ring that the station is on. These tables are shared by all bridge/routers on the internetwork. When a NetBIOS station wants to initiate a session with another NetBIOS device, the router reads the address of the destination device and performs a table lookup for the device's location. If the destination and sending stations are on the same LAN, no packets leave the LAN. If the destination is on another ring, the router checks another table in its memory to find the best route to that ring. Again, no broadcasts are necessary.

Re-establishing Links

The ability of an internetwork to recover from a failed link also has a major effect on SNA session reliability. Because most vendors encapsulate SDLC in IP packets, rerouting is done using router-to-router algorithms like the industry-standard open shortest path first (OSPF) or Cisco's proprietary Interior Gateway Routing Protocol (IGRP).

Some observers contend that OSPF is not fast enough to reroute traffic within SNA's 10 second limit. For large networks, the convergence time — the time it takes all routers to share information and calculate new paths — can stretch into minutes, says Tad Witowicz, CEO of Crosscomm. Vendors using OSPF say such estimates are greatly exaggerated. Karen Barton, Director of Business Development for Wellfleet, says one benchmark performed by a user showed a convergence time of three seconds using OSPF and about seven minutes using the routing information protocol (RIP), the most commonly used router-to-router protocol.

Instead of OSPF, Crosscomm use a proprietary routing algorithm called Shortest Path First (SPF), based on the vendor's PIR software. SPF uses exploratory packets to measure the throughput of links, giving the routers information about the current state of each link in the internetwork. Most of the problems now affecting mixed SDLC and LAN internetworks are likely to be solved once SNA is replaced as the main backbone protocol in IBM networks.

In contrast to SNA's subarea networking, APPN has a two-tier hierarchy: Network nodes and end nodes. APPN network nodes know the topology of the network and can perform intermediate session routing. APPN end nodes, which connect to the network nodes, do not know the network's topology.

One of APPN's advantages over comparable multiprotocol routing protocols is a distributed directory service integrated with the routing protocol and that offers dynamic rerouting of traffic when a link goes down. APPN network nodes provide three services to end nodes: Dynamic registration of SNA resources, dynamic discovery of SNA resources, and automatic selection of routes. APPN is available on most IBM platforms; IBM's 6611 router will support APPN. Most router vendors say they plan to add APPN support by licensing source code from IBM. The time frame for such support varies, by 3Com, an early licensee of APPN, probably will be the first third-party vendor to offer routers with APPN software.

Although vendors will add APPN to their protocol lists, it isn't clear how many users will choose APPN as a backbone protocol. Many vendors have come to the conclusion that the days of single backbone protocols are over. Adding to the confusion about APPN's future is the fact that Cisco has announced an alternative to APPN. Besides licensing IBM's protocol, Cisco says it is developing APPI, ,an IP-oriented version of peer-to-peer SNA networking. Like APPN, APPI will let any APPN end node or low-entry networking (LEN) node communicate with any network node or end node directly without having to use a host directory. Under APPI, APPN and IP are treated as two separate but coexisting networks.

The separation of APPN and IP is brought about by a special router called an Open Network Node (ONN). The ONN communicates with APPN end nodes and LEN nodes using LU6.2, and it communicates with the multiprotocol network using TCP/IP. It also is responsible for linking APPN and IP. Like APPN, APPI also will feature a fully distributed directory. Under the APPI directory service, certain routers are designated to be servers that handle central directory duties. When an ONN receives a packet and the destination address is not in its memory, it directs the request to a central server instead of broadcasting it to all ONNs.

Directory services and SNMP management are part of Stage 1 APPI. Stage 2 will enhance the ONN to include SNA intermediate routing functions — ONNs will act not only as access routers by also as intermediate routers for transporting SNA peer-to-peer traffic. Cisco says it is forming a consortium to develop Stage 2 specifications.

Salvatore Salamone

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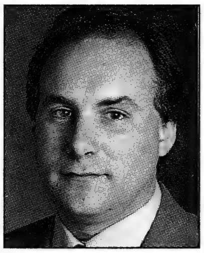

Devil's Advocacy on the Desktop

Graeme Le Roux

When PCs first appeared they were touted as making computing power available to the average user. When Apple, Microsoft and others introduced GUIs to PCs their intent was to make computing power accessible to the average user. Users perceived the centralised EDP environment as restrictive and often counter-productive. This belief was, and is, basically well-founded. A central mainframe or minicomputer is not well suited to handling large numbers of users performing individually trivial tasks. The reasons for this are architectural and unavoidable. PCs circumvent this problem by providing an individual processor for each task. At the time they were the only option available other than simply adding more central computing resources. The cost of central computing power effectively eliminated this later option. As a result of this and intensive marketing by PC hardware and software vendors putting a PC on every desk has become an end in itself. I believe that many in the PC marketplace have lost sight of the fact that it is function and not form that should be the basic criteria for selection of desktop computing solutions. When you last wrote a tender for desktop systems did you consider an alternative to PCs? Do you know what alternatives exist? Alternatives do exist, they can provide the same functionality as a PC and they have significant advantages in a network situation.

If you are working in corporate Australia the machine on your desk is probably an 80386 running Windows that is connected to a LAN and possibly a host of some sort. The basic applications installed on this machine will be a word processor, a spreadsheet, some form of database software and, increasingly, an e-mail client. You are probably thinking of upgrading to an 80486 and increasing memory by at least 50% in the not so distant future. Your reason for doing this is probably to increase the perceived 'speed' of your machine. If you are a network administrator you are likely to be considering the cost efficiency of your system, its security, expandability and future support. You are also likely to be considering how to integrate client-server applications into your existing system. Your servers are probably 80486-based, have about 16 MBytes of RAM and roughly 1 GByte of hard disk. Put another way you are forced to use a single proprietary hardware platform, a highly proprietary system platform — i.e. DOS/Windows and whatever operating system is running on your server — and a group of applications that are not portable and use highly proprietary file formats. While you have a number of sources of hardware all of it is based on three or four key chips manufactured by Intel. You are completely dependant upon the companies that manufacture the system software products you use. Your applications are also dependant upon a single vendor's system software. If you are responsible for a WAN that reaches areas that are outside capital cities you must either provide all support internally or deal with various levels of local external support. This is the price you are probably paying to put a GUI and several bread and butter applications in front of your users. In the long term it can be very expensive indeed.

"What the server is and what it is running is irrelevant."

The fact is that there are recognised, published, international standards that can provide all the functions you are currently getting from your PC. For example X.11 can provide a functionally equivalent interface to Windows. Unlike Windows, X.11 runs on PCs, Unix and non-Unix workstations and X-terminals and provides the capability to run applications software either locally or remotely thus providing the option of a completely expendable unit on the user's desktop. In the event of a hardware failure the entire unit can be replaced — if necessary by the user — as easily as a 'dumb' terminal. Because of the standard nature of the X environment there are as many X applications as there are Windows applications and just as wide a variety of them. X-terminals typically do not have PC memory limits and can support multiple host sessions concurrently with little or no impact upon performance.

Your NOS, which probably comprises little more than a protocol stack, some access controls and a proprietary server environment, can also be replaced by a platform based on non-proprietary standards. It need not be based on an Intel platform or any particular operating system. Network users do not directly interact with the server operating system, they interact with client software, so what the server is and what it is running is irrelevant provided required services are provided. A low-end minicomputer is arguably more cost effective than a high-end PC server, particularly when considering factors like reliability, support costs and WAN functionality. Such machines usually have processing power to burn when used as servers and by deploying them as you would PC servers you have a platform capable of supporting bread and butter applications without a negative impact on performance. This approach provides you with all the advantages of a central EDP operation and the flexibility of a PC environment.

If you do start using minicomputers as servers you also have the option of eliminating proprietary client software. For example you can install a full implementation of the IP protocol suite (often inaccurately referred to as TCP/IP) on your existing PCs. Unlike the clumsy implementations available from some NOS vendors this gives you standard forms of remote boot, file sharing utilities, mail, messaging and management. Such software also typically supports protocols like RARP or BootP that eliminate the need to set-up IP addresses on individual workstations. By using IP you avoid all the limitations of proprietary protocols, make such things as wide area internetworking considerably more straight forward and much more cost effective. You also insulate yourself from the idiosyncrasies of individual vendor's views of your networking future.

Of course, as the late Robert Heinlein pointed out, there ain't no such thing as a free lunch. You will not be able to simply start from scratch and so will have to manage a period of integration. It is likely you will also have to review your existing transmission systems. Perhaps the ultimate irony is that you will have to convince a sceptical management group that PCs are not the answer. You must also be aware that sometimes PCs are the answer. The 'message' in this article is that standards are your only defence against the vagaries of the IT industry. Standards are rather like gravity; you can temporarily defy them by expending resources, but in the long run you will have to except the inevitable — a nasty fall.

Graeme Le Roux is a Director of NSW-based Moresdawn Pty Ltd and specialises in local area networks consulting services.

INTERNETWORKING

Async Routers on the Comeback Trail

Daniel Gasparro

Given the industry's ongoing love affair with high priced, high end services like ATM, Fastpac and frame relay, I've got some serious reservations about talking up a technology that dates to 1968. But for my money (and probably yours), asynchronous routers and dial-up phone lines are a viable alternative to high speed digital services. I'm not suggesting that analogue circuits can meet all your interworking needs, but from what I've seen (and heard) about the new async routers coming to market, overlooking this option could prove a costly mistake.

Let's face it, times are tough. Many corporations are looking to slash their telecom budgets in the coming year. And that's going to make it even harder to justify the cost of dedicated services for small, remote offices. The situation is even worse overseas — particularly in the former Eastern Bloc. Besides budget woes, those folks may not even have access to quality high speed circuits. They've got no choice but to make do with asynchronous communications.

Don't assume that opting for async routers means settling for less. The revamped boxes starting to show up deliver network-to-network connectivity over dial-up lines. I'm not just talking about the file transfers and terminal emulation that are async routers' stock in trade. Today's products can access remote applications and network resources using the native protocols of most networks.

Async routers are out or on the way from several vendors, and more will surely follow. US-based Shiva has the LAN Rover and Telebit has the Netblazer (which is distributed in Australia by NetComm). Multitech Systems and Network Products also have something in the works.

But don't confuse these boxes with the scaled-down routers for remote sites recently released by Cisco Systems, Crosscomm (distributed by Scitec), Proteon and Wellfleet (distributed by JNA). These vendors' devices are just fine for multiprotocol environments that require dedicated lines, but they're decidedly overkill for small offices that don't need constant access to the wide area.

> *"Async routers deliver dial-up connectivity and can access remote applications using the native network protocols."*

It's interesting that the high-end router makers are the first to disparage async routers. The critics charge that user demand is nonexistent and that the technology is too slow for internetworking applications. From what I've seen out in the real world, users are hungry for these products. And after almost six months setting up Netblazers at different sites, I know that while the technology is far from perfect, it meets the needs of offices with two to 10 users. And the price of asynchronous routers is hard to beat. The basic Netblazer goes for $5,995 (including tax), compared with over $9,000 for Wellfleet's AFN.

The original Netblazer made its debut two years ago. The vendor brought out several new models last April that feature greater capacity and improved management. Right now, Netblazer can be equipped with either one Ethernet or one Token Ring interface card. (Telebit says multicard models are on the way.) The WAN link is made via the dial-up async lines, and a top-end Netblazer can handle 10 async ports. Support for multiple asynchronous lines means one remote site can be linked simultaneously to several other locations. And multiple async lines also enable the Netblazer to meet the bandwidth demands of most applications.

The high end model also has a synchronous port, which can be used with a leased line. That's a nice feature and lets the Netblazer perform internal dial backup or backup other routers. It also means the box won't become obsolete if traffic levels at the remote site reach the point at which leased lines become economically feasible. Using a Netblazer for dial backup simply means configuring a conventional router to shunt data to the Telebit unit in the event of a line failure (a standard capability of any router). Netblazer will then determine the destination of the packets based on their IP addresses.

As much as I like Netblazer, it doesn't earn my wholehearted approval. When it comes to routing protocols, it's pretty much a washout. As of late last year it supported RIP but not OSPF, which means it can't take advantage of parallel paths or alternative links. However, Telebit is responsive and late last year added AppleTalk Phase 2 and IPX to its already existing TCP/IP support. Both will be welcomed by users since Macs are a favourite of users outside of the corporate mainstream and IPX will give remote PC users a way to become full-fledged participants on a remote NetWare LAN.

Netblazer sends data over the wide area using SLIP (Synchronous Line IP) and other serial communications protocols, and goes point-to-point using the IP address of the destination. Configuring the box is a far cry from rocket science, since it basically involves entering the IP addresses of remote networks into each router's software and adding a corresponding phone number that will be dialed to establish the connection. Netblazers work with Telebit's Worldblazer modems. These standalone units use Turbo PEP (the latest version of the Packetised Ensemble Protocol algorithm) to hit a top throughput of 70Kbps, where communication is both full-duplex and error-free.

Is 70Kbps fast enough for internetworking? Not for all applications, but Netblazer can establish a point-to-point connection that uses all 10 async lines and 10 Worldblazer modems. The aggregate bandwidth of the link equals the total of all the lines. With the full-blown configuration, it could hit just about 700Kbps. And Netblazer can allocate bandwidth on demand. So as requirements change, it automatically establishes and terminates connections.

Finally, for sophisticated on-site users or remote network managers, Netblazer supports SNMP, including MIB I and MIB II. Thus, the box can be monitored and controlled from a central management console. In the end, whether or not Netblazer is the box for you is a matter of how well it matches specific needs. Does it support all the LAN interfaces available at the remote office? Can it be configured and maintained without having to send a tech support staffer out from the main office on a regular basis?

Keep in mind that a little patience may pay off big in this market, since it's likely that other router and modem vendors will announce products in the next few months. And one more thing: Don't let high-pressure sales people, high paid consultants, or highly regarded tech writers for slick networking magazines talk you into high-priced technology you don't need.

Daniel Gasparro is Director of communications products with US-based Automation Partners International.

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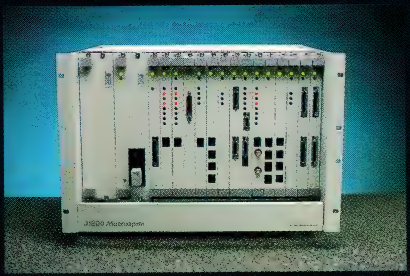

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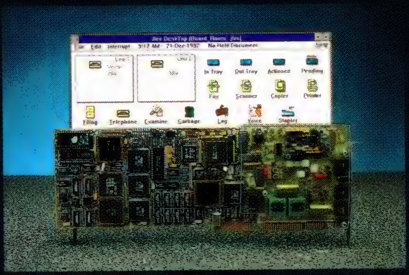

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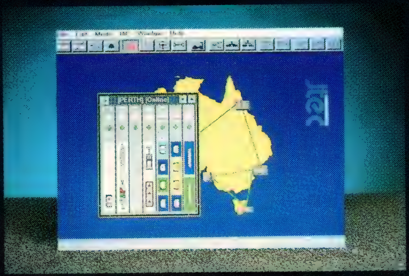

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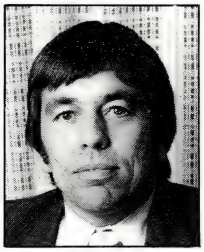


OSI — Media and Documents

Alan Lloyd

In previous *OSI Tutorials* on X.400 MHS and X.500 EDS the areas of documents, information and message types were examined. It's well known that within the design of OSI communications protocols, distributed message and directory systems should be consistent to provide system interoperation on a global basis. This will enable information to be transferred between the users of such systems. However, it's meaningless to transfer information if the recipient, be it a user or a device, cannot determine what the information is.

To resolve this issue a major effort in the standardisation process is being applied to document and message information formats and their syntax. Developments in multimedia, hypermedia and audio visual services are also being accommodated within this standardisation process. So while this *OSI Tutorial* focuses on standards related to documents and information, with their new found emphasis on the emerging multimedia, hypermedia, audio visual services and X.400 messaging standards, note that these standards are still being formulated and may be subject to change.

History of Document Standards

Three major areas of information standardisation have occurred over the last decade or so, as shown in Figure 1. The motion picture and photographic information formats are being worked on by expert groups. Telecommunications and related areas, including telematic devices such as fax, telex and text information, are being standardised by the CCITT. For documents and files, computer hardware and software suppliers are contributing to the ISO/OSI Office Automation standards such as Open Document Architecture (ODA) and Standard Generalised Markup Language (SGML).

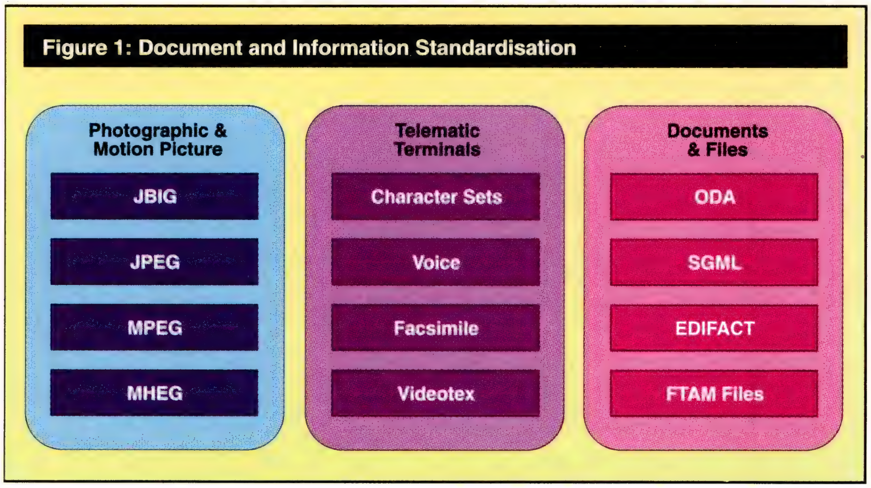
These formats still have a fair way to go to achieve harmonisation and interworking, because there will be issues of conversion and interoperation if using a number of information types. In the longer term, these interworking issues should be reduced.

Multimedia and Hypermedia

Multimedia involves two or more medium (e.g. audio and video) with little system information attached relating to sequencing or linkage between the information elements. Television transmission is a classic example of multimedia.

With today's computer-based graphics applications, information in a multimedia environment needs to be selected interactively by the operator. For example, a real estate agent's application might let the user select and review a house within a street and then select a room within that specific house. To provide this capability, the fragments of the audio and the video sections presented to the user are linked with additional information to provide the necessary contexts. Information with these linking structures is referred to as hypermedia.

Figure 1: Document and Information Standardisation



Photographic & Motion Picture	Telematic Terminals	Documents & Files
JBIG	Character Sets	ODA
JPEG	Voice	SGML
MPEG	Facsimile	EDIFACT
MHEG	Videotex	FTAM Files

This is one of a series of open systems tutorials by Alan Lloyd, Strategic Systems Group Manager for Datacraft Australia. Alan represents Australia on numerous international standards bodies and is the co-author with Gary Dickson of *Open Systems Interconnection* (Prentice Hall, 1992).

In the ODA document standards, hypermedia links are defined for temporal relationships (providing time-specific references between components of a document, so an image might be displayed when a certain point is reached), partial documents (linking parts of document), external references (linking separate documents) and non-linear graphs (structural specifications beyond that of the standard ODA structural capability).

Photographic and Motion Picture Information

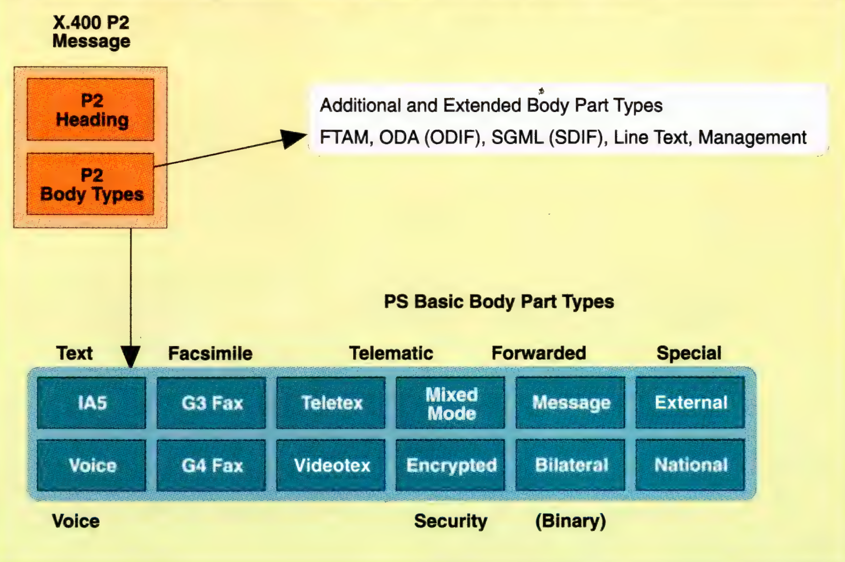
Initially there were three main 'Joint Expert Groups' working on this area of standardisation — JPEG, JBIG and MPEG to deal with photographic (JPEG), bi-level, or black and white (JBIG) and also motion picture (MPEG) information respectively. More recently, because of the interest in the multimedia area, MHEG (the Multimedia — Hypermedia Expert Group) has now been formed. These expert groups now cover the historic, current and emerging technologies associated with photographic, motion picture and multimedia data.

An important feature of MPEG is the wide representation of different industry sectors: Broadcasting, telecommunications, consumer electronics, computer manufacturers, VLSI designers, etc. These sectors are collaborating to develop standards for audio visual coding with the ambitious goal of breaking the barriers of interoperation of multimedia applications. The MPEG group has recently released an ISO standard as a draft (CD 11172), titled *Coding of Moving Pictures and Associated Audio for Digital Storage Media up to 1.5Mbits.* The MPEG work will also flow on into the areas of digital transmission requirements for multimedia communications services.

Telematic Terminals

CCITT 'T' series recommendations have been with us for a long time and provide a

Figure 2: X.400 MHS Body Part Types



wide range of information and character set standards. The T.3, 4 and 5 recommendations cover the G2, G3 and G4 facsimile interchange formats and protocol. The T.61 recommendation provides the teletex formats, T.50 provides the IA5 character set and T.73 provides the standard for mixed mode devices (fax and telematic). In fact the T.73 recommendation should be seen as the genesis of the ODA standards. ODA is a superset of T.73, classified as the CCITT T.400 series and ISO 8613.

ODA and SGML, EDIFACT and FTAM

These standards are directed at the business and office areas of document definition, construction, interchange and storage.

ODA provides the ability to specify a document in terms of logical and layout structure or a composite of both. A document can be in a number of forms. A processable form can be revised. A formatted form has transmission or rendition information and cannot be edited. A formatted/processable form contains presentation information but still can be edited.

There are a series of standards forming the T.400 ODA series. They cover general principles, document structures, document profiles, interchange formats, character content, raster graphics content, geometric content and more recently audio content architecture. Audio in this case can use the CCITT G.721/2 (voice encoding) and the CCITT J.41 (stereo and mono) recommendations. ODA documents are described in the common OSI syntax of Abstract Syntax Notation One (ASN.1).

SGML as defined is a markup language, markup being a term used by the publishing community. It is directed at defining the structure and attributes of a document in a formalised way and is defined by ISO 8879 and its related documents.

At the highest level, a Document Type Definition (a DTD) is defined. A DTD provides the rules, as determined by the application, that apply SGML to the markup of documents of a particular type. The DTD is expressed in document element types, element relationships and attributes and references that can be represented by the markup. It defines the vocabulary of the markup, while SGML defines the syntax.

SGML is in fact a language with facilities for specifying named attributes of character data, such as character sets and document positional elements, within document references and identifiers. For those wishing to fully explore SGML, ISO/IEC/TR 9573 (AS 3967) *Techniques for Using SGML*, is quite useful reading.

EDIFACT

The Electronic Data Interchange for Administration, Commerce and Transport (ISO 9735 and 9732) standard defines the high level business protocol for business message interchange. EDIFACT is widely accepted (via the GOSIP process) and will hopefully emerge as the predominant interchange protocol. ANSI X.12 and United Trade Data Interchange are the other widely used EDI interchange formats. The EDIFACT protocol defines the format for interchanges, messages and message attributes or data elements. In addition there are EDI interchange/message definitions which define the structure of the messages such as invoices, orders and their component parts.

EDI messages can be carried over telex or any agreed communications protocol. With the development of X.400 MHS, EDI is seen as a typical messaging application that can be exchanged over the X.400 Message Transfer Service. Within the MHS environment, the support of EDI is viable using the EDI message as a body part over the Interpersonal Messaging Protocol (IPM-P2). New developments in X.400 have introduced Pedi (Protocol for EDI). In Pedi some of the EDI interchange protocol fields are mapped directly on to the X.400 User Agent message header.

The main differences between X.400 EDI interchange and the X.400 InterPersonal Messaging (IPM) are in the forwarding and notification areas. In EDI interchanges, a message may be sent to one party, who modifies it and forwards it on to another party. A typical example is a payment advice or cheque sent by the purchaser to the seller and then forwarded with additional information to the bank for clearance.

FTAM

File Transfer Access and Management is usually regarded as a file transfer protocol. However, it is impossible to have a protocol to deal with file access if you do not understand the files and the file store structure they reside in. Therefore, the File Transfer Access and Management standard also deals with the abstract access and structural aspects of file systems. FTAM files are defined as document types. In FTAM, files are defined as inverted trees with nodes and the file data is attached to these nodes. The tree structure is defined as a specific Constraint Set and has the choice of being unstructured, sequential ordered, flat or hierarchical.

Access to the information from these file nodes is determined by the type of Access Context used. This may be flat with node and/or file record data or hierarchical, with node and/or file record data. The agreed combination of specific Constraint Sets (the file structure) and Access Contexts (how it can be accessed) are used to specify the particular FTAM document type.

File Transfer Access and Management defines a number of document types, such as unstructured binary, structured (record based) and directory type. The standard list of FTAM document types has been extended to cover EDIFACT and Open Document Architecture, thus formalising the transfer and access of EDI messages and ODA documents over FTAM services.

Message and Document Interchange

Because X.400 was developed mainly to meet the needs of PTTs, X.400 has been designed with the ability to carry many types of information as body parts. This includes the OSI data interchange formats such as EDIFACT, ODA, SGML and FTAM. Figure 2 shows the standard body parts and those being added because of emerging document standards.

Multimedia, Hypermedia and AV Services

From an information definition viewpoint, the MHEG group is defining the way in which audio visual information is linked. This can be defined in terms of SGML or Abstract Syntax Notation One (ASN.1). Hypermedia definition is performed via a range of object types identifying the media information and link objects to characterise the relationships of such. The types of medium

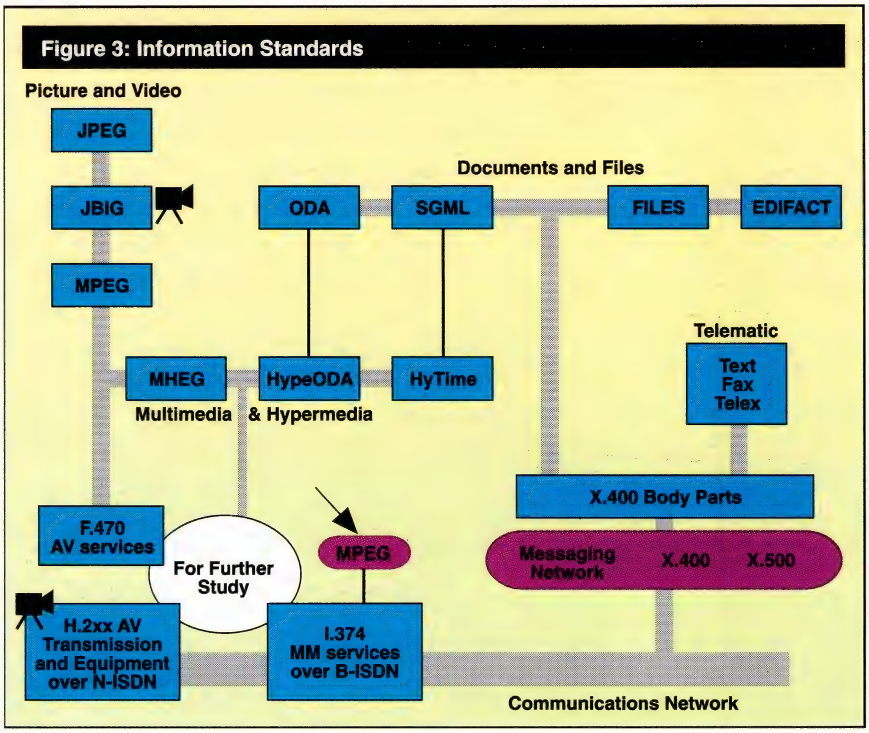


Figure 3: Information Standards

considered as hypertext information are text (ASCII, EBCDIC), graphics (CEPT, videotex, Computer Graphic Metafile), audio (CCITT G.711, MPEG audio), still picture (G3 fax, JPEG) and audio visual sequence (CCIR .601 plus audio and MPEG audio/visual).

Link objects permit the definitions of triggers (that initiates the link processing to access the referenced target object), actions (e.g. run, stop, select, reset), processing (straight, number of cycles or continued cycle), delay and positional references. The Multimedia Hypermedia Expert Group document (Part 1) is still in draft form within ISO standards IT/I/29.

HyperODA (ODA)

The extensions for HyperODA temporal relationships are still draft standards. This standard defines the structure of the links between ODA objects referred to as nodes. These links contain attributes which specify node references (what nodes are related), synchronisation type, time parameters and process control (e.g. cyclic). When processing such documents (e.g. via manual selection or replaying), these links cause the various actions or display selections to be made.

HyTime (SGML)

The SGML group has introduced two main standards associated with hypermedia — HyTime (Hypermedia/Timebased Document Language) and SMDL (Standard Music Description Language). Hytime represents hypertext linking by virtue of references or contexts, time, scheduling and synchronisation. These links handle user driven display sequencing. While the concepts are similar to those of HyperODA, HyTime, being a language, is currently far richer than the ODA counterpart.

Open Document Language, which permits the transformation of information between ODA and SGML, is not currently defined for hypermedia, but when this is specified, the full interchange of hypermedia information between the two standards should be possible.

SMDL uses the contextual definitions of HyTime and defines a language for representing music in an abstract manner that is neutral with respect to how it is performed on a score. Again, being a language, SGML defines elements for music notation, elements such as tempo, pitch and chords.

Network Services

With the above information being defined from an information generation perspective, there needs to be a tie between the information component of multimedia and the way in which a network supports services which transfer it. If multimedia information is moved as a message over X.400 then the network service requirements are that as for messaging, not real time. However, if the network has to deliver specific facilities for transferring multimedia, different rules apply.

Audio Visual Interactive Services

CCITT F.470 is being produced as a high level draft for Audio Visual Interactive Services (AVIS). It does not prescribe network services per se. It attempts to define the service model for dealing with Audio Visual Interactive applications. This document embraces information types of text, graphics, audio and video, identifying functions such as retrieval, interactive consultation, rearrangement and also modification of information elements. More specifically, its model identifies authors and preparers for multi-party AV information production. This work is similar in concept to that of the emerging work on Group Communications (X.400) from ISO IT/1/18.

Terminal Interfaces and Transmission for Audio Visual Services

The ability to transfer AV information over networks requires bandwidth management, signalling and terminal interface specifications. Some of the CCITT H series of recommendations provide these definitions. The CCITT H.221 provides the frame structure for AV between 64 to 1,920Kbps. H.230 defines the frame control and indication signals for AV systems. H.242 defines the method for establishing AV communication up to 2Mbps. H.261 defines video codec for AV at p x 64Kbps (p = 1-30 e.g. Primary rate ISDN). H.320 defines narrow band visual telephone systems and terminal equipment. These recommendations are directed at video teleconferencing and other applications over current digital networks. However, H.221 and H.230 could be used for the transmission of MPEG and MHEG information.

Multimedia Services with B-ISDN

One of the draft output recommendations from CCITT is I.374 titled *Network Capabilities to Support Multimedia Services*. The purpose of this recommendation is to identify the capabilities required for both B-ISDN and 64Kbps narrowband ISDN services. I.374 addresses the association between information types (e.g. audio and video) and their use of distributed service logic as defined by the Intelligent Network Model (CCITT I.312). The reason for associating the media with the network processing logic is to deal with the issue of multimedia call scenarios of multi-point, multi-connection and multi-party services.

Future work in this area will progress multimedia service modelling, network control and management and transfer of control. This work is being performed in liaison with CCITT Study Group 15 which deals with audio and video coding (MPEG). Figure 3 depicts the possible relationships between these standards.

Long Term Benefit

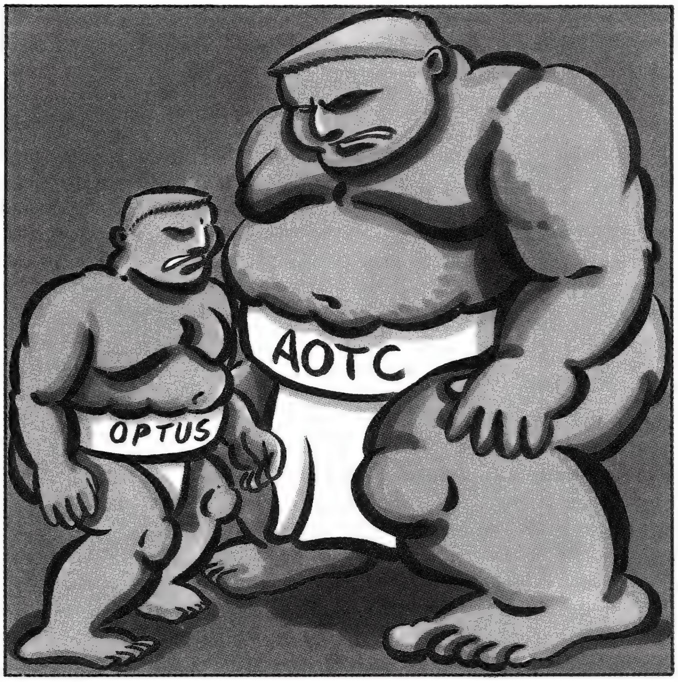
Although the above work is in the draft stages and there are some uncharted areas, there is a fit between standardised information and the services that transfer such information, be it message or real-time based. The work is still draft because of the issues involved. As we move to high performance, service-based networks, the issues of signalling, control and management become more complex. Therefore standardising information for multimedia and hypermedia is not just the issue. It is the network design (its services and its management) that transfers such information that is the major area of work. However, from a business perspective, directing information policy at the use of such standards will certainly have long term benefit and to some degree, future proofing IT strategies.

Alan Lloyd

Dominance and Telephones: The Coming Battle

Regulation of the dominant carrier is a central theme of the Australian telecommunications regulatory regime. Peter Waters considers a recently released BTCE report on the meaning of dominance.

When introducing the new telecommunications legislation the Government's fond hope was that eventually competition between carriers (and service providers) will be sufficient to adequately discipline behaviour in the market. However, the Government also realised that a sudden shift from a monopoly environment to open competition would not work. The Government also recognised that it was not simply enough to limit the number of players but also the playing field needed to be tilted towards a new player if the game was to be fair. Hence the emergence of the dominant/non-dominant theory of regulation which provides that certain regulatory requirements only apply to the dominant carrier.



Dominant Regulation

This theme of dominant/non-dominant regulation is weaved through a number of sections of the *Telecommunications Act*. Section 141 provides that interconnect agreements negotiated between the telecommunications carriers must comply with any determinations issued by the Minister for Transport and Communications which establish principles on calculation of interconnect charges. The only pricing determination issued regulates the prices at which AOTC is to provide Optus with interconnection and other services. The pricing determination sets some charges, such as the 3.14 cents per minute access charge and provides that other services are to be negotiated on the basis of the direct cost to AOTC in providing those services to Optus (e.g. directory services).

The pricing determination provides that where AOTC is no longer dominant, these controlled charges cease to apply and the carriers are to 'commercially negotiate' a set of subsequent charges. The pricing principles set some triggers related to Optus' market share, the principal trigger being 20% of national market for international or long distance traffic. Once those triggers go off the onus shifts to Optus to establish that AOTC is still dominant.

The customer tariff rules are also tightly constructed around dominant/non-dominant carrier regulation. Both carriers must file tariffs for any basic carriage services which they offer to the public. While the non-dominant carrier is entitled to strike 'off tariff' deals below the tariff, the dominant carrier is required to charge in accordance with its tariff. The theory is that if the non-dominant carrier's individual deals are not known to the dominant carrier, there will be the uncertainty in the market which is required to drive competition. If a dominant carrier's pricing is public, it is easier to detect any competitive behaviour by that dominant carrier.

A dominant carrier also is not entitled to discriminate in its tariffs between different customers except if these differences make a reasonable allowance of differences in the cost of supplying services as a result of a limited range of factors, such as transmission capacities, different places from and to which services are supplied, different contract periods and different performance characteristics.

The dominant carrier is also required to supply to a service provider a BCS at the same price as the carrier transfers the BCS to its own high level service which competes against the service provider.

But there is no need to apply these constraints to a non-dominant carrier's pricing policies because if the non-dominant carrier charges more than the dominant carrier, customers and service providers will simply defect back to the dominant carrier.

Meaning of Dominance

As AOTC will be released from these regulatory chains when it loses dominance, the meaning of the term dominance assumes critical importance. Surprisingly, this crucial term is left undefined. Section 28 provides that a carrier is to be taken to be in a position to dominate a market if, and only if, it is in such a position for the purposes of Section 50 of the *Trade Practices Act*. This, however, is not much more helpful because the *Trade Practices Act* itself does not define 'dominate,' leaving it to the courts to sort out. The Trade Practices Commission has commented that the power to dominate a market is a lower threshold than the power to control or monopolise a market. This recognises that there may be other competitors in the market who hold a significant market share but that there is a major firm which holds 'a commanding influence' or, has the ability to prevent effective competition and has an appreciable influence on the conditions under which competition will develop. There is no absolute benchmark of market share which is equivalent to dominance. However, Australian courts have held that a company with 65% of market share was dominant and a company that would increase its market share through a takeover from 60-70% would become dominant.

Telecommunications Markets

As the Bureau of Transport and Communications Economics (BTCE) noted in its report on dominance in the telecommunications industry (entitled *The Australian Telecommunications Market — When Does Dominance Cease?*), the critical threshold question in working out whether a carrier is dominant is to define the relevant market. Widening or narrowing the definition of market can make a company which looks dominant suddenly look not dominant. One of the principal factors in determining whether different products or services are in the same market is the extent to which they are substitutable for each other. If a consumer's requirement can be met by purchasing services from either Company 'A' or Company 'B,' then Companies 'A' and 'B' are in the same market. The products need not be exactly identical in characteristics or even price.

The US Federal Communications Commission has decided that there is only one product market for domestic long distance services in the United States. The FCC took this view on the basis that it was relatively easy for carriers to respond to customer demand in different parts of the national market as there were no substantial technological, economical legal barriers blocking rapid re-allocation of carrier resources.

However, the BTCE thought that the FCC placed too little emphasis on 'demand side factors.' In the BTCE's view, markets may need to be more narrowly defined in terms of the point-to-point communication. The market is not the product market of international or domestic long distance services, but the market for calls from point A to point B (country or city 'pairs'). The BTCE argues logically that if an Australian customer wants to call her son living in the UK, international telecommunications services offered to Nigeria aren't substitutable. The only substitutable services are other services offered by different carriers to the UK. On a similar basis, there also may not be a national market in trunk services, but rather a host of individual markets, such as Sydney-Brisbane.

The effect of narrowly defining telecommunications markets in this way is that when Optus obtains a reasonable market share on a particular route, or perhaps constructs its own facilities, AOTC would no longer be dominant on that route. This would be the case even if AOTC was still dominant on most other routes and still accounted for most trunk traffic throughout Australia.

Optus hotly disputed this market definition. In Optus' view, customers do not tend to chose between carriers on particular routes, but reach a view about whether one carrier is generally cheaper for a particular product (i.e. long distance) than the other carrier. Optus asserted that AOTC's Flexiplans bundling total traffic together reflect this consumer approach. Optus also pointed out that with the introduction of preselection, customers will no longer be choosing to use Optus or AOTC on a per call basis, but will be choosing between both carriers for all their long distance and international calls.

However, the BTCE concluded that they thought the international market could be characterised on a country pair basis because of the ease with which a new entrant can get into the market, for the reasons discussed below. BTCE left open the question whether domestically the market should be segmented on a city pair basis.

Market Share

One of the key criteria in determining dominance is the extent to which an existing player in a market is protected by high barriers preventing or retarding entry of competitors. Even though a company may have a fairly large market share, if the barriers to entry are low the company's market share will be unstable and it is probably not in a position to charge monopoly rents.

The Bureau of Transport and Communications Economics considered that the barriers to entry in the international market were relatively low and that competitors to AOTC may be influential in the market at very low market share level. The BTCE noted that international capacity could be fairly readily obtained by new entrants through Intelsat. Yearly ordering meant that Optus would not need to invest substantial capital amounts to obtain capacity upfront, and there would not be a large overhang of capacity which results in low post entry prices and sustained economic losses. The BTCE also noted that capital costs of international cables had dropped dramatically, reducing Optus' entry price into cable consortia.

The BTCE also considered that Optus will be able to readily enter into correspondent agreements with foreign carriers. The international practice appears to be that foreign carriers will enter into agreements with new carriers who have as low as 3-6% of market share. The BTCE also considered that the extensive international relationships which Optus' shareholder Cable & Wireless has would give Optus entree with foreign carriers.

Optus' View

Optus considered that the BTCE had underestimated the difficulties facing Optus. Optus noted that on certain international routes there was limited cable capacity. AOTC had planned cable capacity in the past on the basis of it continuing to be a monopoly, and with the entry of Optus some of that capacity should be freed up and made available to Optus. Optus also noted that AOTC's ability to deliver a much higher level of traffic to the foreign carrier may enable AOTC to obtain more favourable accounting rates. The BTCE recognised that the barriers to entry in the domestic market were significantly higher. Optus had to expend considerable capital to build a domestic network, Optus also would continue to be heavily dependent on the AOTC local loop for access to customers. The BTCE noted that the local loop was still generally considered to be a 'natural monopoly.' Control of the local loop gave AOTC 'bottleneck' power which could be used to competitively damage Optus.

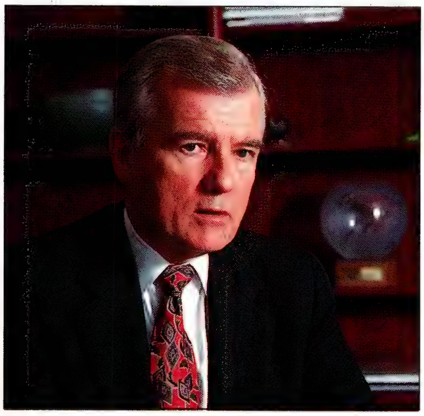
While the importance of AOTC's ownership of the local loop should not be minimised, the BTCE thought that there were several factors which reduced the scope for any misuse of market power by AOTC. Optus is likely to become AOTC's biggest customer and AOTC financially benefits from higher usage of its network by Optus. Further, if Optus gains a significant market share of trunk and international services, Optus will be a large and powerful player in the telecommunications market and the carriers will be more evenly matched in their negotiations. Finally, any abuse of AOTC's local loop bottleneck would breach the *Trade Practices Act.*

Optus argued that its success in obtaining significant shares of long distance or international market will not necessarily provide it with the defence against AOTC's bottleneck control as Optus has no choice but to access customers through the AOTC local loop. Optus also argued that the vertical integration of AOTC's domestic and international long distance services with the local loop gave AOTC an unrivalled advantage. Finally, Optus pointed out that the *New Zealand Commerce Act,* which is equivalent to Australia's *Trade Practices Act*, had failed to ensure a fair access agreement.

Conclusion

Tackling the meaning of dominance in the telecommunications industry was never going to be an easy task. However, the Bureau of Transport and Communications Economics has produced a report which substantially pushes the debate along. AOTC's view of dominance in the international market has obviously found greater favour with the BTCE than Optus' views. However, the BTCE's report suggests that AOTC may bear the dominance tag for a significant time in the domestic market.

Peter Waters is a partner with the Sydney technology law firm, Gilbert & Tobin, and specialises in telecommunications and information technology contracting and regulation. This column sets out his views and not those of clients of his firm.



Frank Blount — Competition, Jobs and Shareholder Value

Frank Blount

Chief Executive Officer, AOTC

Frank Blount took up his position at the helm of the Australian and Overseas Telecommunications Corporation (AOTC) in January 1992 after broad experience as an executive with Southern Bell and AT&T in the United States. An electrical engineer by training, he has a Masters degree in Business Administration. He spoke with Liz Fell in Sydney late last year.

What have been your major achievements since joining AOTC?

Blount: Well, Liz, first off I'm very pleased with the reaction of the people at the coalface to our customer focus. The coalface people are doing a hell of a job to meet the challenge of showing our customers the best possible service. The feedback we are getting indicates that people inside the company and outside it are noticing the improvement. We've still got a way to go, but I'm proud of what we've achieved so far.

Secondly, the top of this organisation is coming together as a strategic critical team that understands the major initiatives and issues; we're not playing turf battles the way we were at one point. We'll see just how good we really are in 1993 because it is going to be a major competitive year. I think we have a much better handle on our cost structure, and we're bringing some marketing discipline and financial integrity and financial systems to the place that we didn't have a year ago. Strategically, we know better about where we want to go, and why, how much it's going to cost and where we're going to get our returns.

I think we are much more sensitive to our staff all up and down the line and we have a better relationship with our owner in terms of candour and understanding. Am I satisfied? Hell, no. We've got a lot more to do.

AC: *In what areas has your US experience proved an advantage or disadvantage?*

Blount: My previous experience is relevant not because it's 'American,' but because it encompasses working for a telecommunications company in a competitive environment.

AC: *Okay. I was assuming your experience with long distance competition in the US was relevant.*

Blount: The relevance is just that. The last 10 years in my 30 year career with the Bell system is somewhat transferable to this market. The fact that I have lived through 10 years of something not totally similar, but certainly not dissimilar to what we're going through has to be an advantage. I don't think anybody else here in AOTC — I can't speak for the competition — has been through what I've been through the last 10 years. I've been fond of saying that I had the same experience replicated over and over again for 20 years in a row, and then 10 years of real experience in the marketplace which made me change a lot of attitudes and opinions about how things ought to be done.

AC: *You said the local scene was not totally similar. What are the major differences?*

Blount: Well, the divestiture of the Bell system divided the local exchange business from the long distance business in general, whereas this regime has a full-scope competitor, local and long distance, wherever it makes sense. A second difference is, frankly, that the union situation is a lot stronger, a lot more pronounced than in the US. Beyond that, the differences begin to pale. The full-scope nature of the business is the major difference.

AC: *What about the duopoly structure?*

Blount: We had basically a duopoly with MCI and AT&T in the United States for a long time, even though there were a lot of resellers. As much as I love Bill Esrey, my good friend from Sprint, I have to tell you that he was a non-player for several years before they became much more of a player.

AC: *In your early press interviews, you anticipated there might be some resentment to a foreigner. Have you encountered that?*

Blount: Early on, and in very sparse situations, I sensed it. A couple of times I guess I saw it more obliquely than just sensing it. In general, I have to say that either I'm so insulated that I don't know it's going on or it just does not exist. But it is not an issue. I continue to worry a little bit in the sense that as I make decisions I want to make sure that I'm not making them in an American sense but in an Australian sense. I'm very sensitive, for example, to recruiting people from the US into this company, particularly at senior levels. I'm very much trying to focus my recruitment efforts in Australia and places other than the US for that reason.

AC: *I imagine that as unemployment surges in Australia, there will be bursts of anti-foreign nationalism.*

Blount: Sure, but the truth is that even if I did bring a few senior people from the US, we're talking about two or three jobs. We're not talking about hundreds or thousands.

AC: *I understand you recently brought a head of marketing from the US?*

Blount: Yes, Charlie Zoi is the only senior person I've brought. I don't have plans at this point to bring any more. I inherited two senior Americans when I came, and I've added one.

AC: *Is it correct to say you believe we have a shortage of 'technical marketing' skills?*

Blount: Well, commercial marketing skills.

AC: *So you are importing those skills?*

Blount: Hopefully, we can grow them and find them here. So far, it's been problematical to find them. That doesn't mean they don't exist, it just means that we haven't ferreted them out. At the senior levels, it was almost impossible to find them here. I think we're growing our own, but it's going to take some time. In this particular technical industry, if you think about it, we were the industry. So if we didn't have the skills inside, therefore, almost by definition, we had to go outside.

AC: *Your previous telecoms experience was with a private company. Are there some disadvantages with a government enterprise?*

Blount: I'm sure there must be, but they're so miniscule in the overall scheme of what I deal with every day, that they really are a non-issue.

AC: *Haven't you encountered uninvited political interventions in the last 12 months?*
Blount: No. I haven't had to deal with uninvited intervention. Sure, we are asked questions from time to time, but you have to expect that — I don't know of one example of political intervention.

AC: *What about the APPM [Australian Pulp and Paper Manufacturers] contract and the loss of jobs?*
Blount: No. Let me back up from that because I've said this over and over again. I have been pleasantly surprised at the lack of interference. Before I came, I was perhaps forewarned that there would be a lot of political interference working for a government business enterprise. That has just not manifested itself.

I have been now involved with four Ministers including Kim Beazley, whom I spoke to before I came. If I put all four together and include the Department — DOTAC and others — I have had very much support and very little, if any, of what I call intervention or interference. Sure they ask questions, but so do stockholders. If you were a public company, you'd have stockholder meetings, and they'd be asking questions just like Coles Myer has been asked a lot of questions lately.

Now you raise the APPM paper issue. Never once did any Minister or any Government official ever call me about APPM. I responded to the fact that I thought we did not handle that very professionally. When I saw the form letter that we sent for a 20-year supplier to say that we're no longer going to use your services, I got upset because, by the way, they were also a very major customer of ours. You don't treat a customer that way. So I talked to the people at APPM, and we got a better deal. But the Government never called me on that.

AC: *I understood some politicians couldn't resist playing around with your plan to abolish 4,400 positions because they didn't want to lose jobs in marginal electorates?*
Blount: No politician would want that. We recognised that was going to be an issue, so before it was ever announced, I went to Canberra with Doug Campbell. We spent two days visiting MPs and a Labor Caucus meeting which, I'm told, was as well represented as any other meeting in years because we had 30-40 people. We went through all of our plans. And did they all like it? No.

AC: *But didn't you change the plans?*
Blount: No. What we took in, we announced.

AC: *What about the requirement to submit a Corporate Plan. Does it provide an opportunity for continuous Departmental monitoring, oversight and even intervention or do you regard this activity as quite reasonable because of the shareholding?*
Blount: Quite reasonable. We have worked very hard with the various departments, DOTAC, Finance, Treasury and others to make certain that they are fully briefed on the details of our plans, particularly on the financial implications of our plans. We have sponsored meetings with them to go over the corporate plan in detail and will continue to do that regularly.

AC: *And so far that has worked?*
Blount: That's working very well and we've committed to continue that as long as the ground rules are understood. But if you start taking the information we're sharing and using it to ask more and more and more questions, then I've got a problem. If you take it to gain understanding, in the true sense of that word, it will help you and us do a better job of managing this complex business together. I'm all for doing that.

> "We spent two days [in Canberra] visiting MPs and a Labor Caucus meeting . . . We went through all of our plans. And did they all like it? No."

AC: *What advantages does Optus have as a greenfields entrant? For instance, do you believe its new Operational Support System will be an advantage?*
Blount: If you were to draw a balance sheet and put assets on one side and liabilities on another then we've got market share, they've got to win it; we have entrenched systems and culture some of which are not up to speed, they can hire and create culture as they go; they have a very much more variable cost structure at day one, ours is much more fixed for the volume we have. So it's really hard to say on balance. On some days I wake up and come to work and say 'Gee, I wish I was them.' On other days I say, 'Gee, I'm glad I'm not them.' I hate to sound like I'm trying to walk the middle of the road, but on any given issue, there really are advantages and disadvantages.

AC: *Have you got the results on the first few month's competition?*
Blount: Sure, I get results every week.

AC: *How are you bearing up on the busy Sydney-Melbourne route?*
Blount: Liz, that's proprietary information. We don't give out market share information for obvious reasons. Most of our people don't even know that market share number.

AC: *Is Optus hurting?*
Blount: Sure. Monopoly is wonderful. You have 100% market share, it's wonderful, it's cosy, it's nice. But the truth is that we know we're going to lose market share. You can't keep 100% in a duopoly. Is it hurting more than we expected? No. Is it hurting about what we expected? Yes.

AC: *What about the Trade Practices Commission [TPC] intervention on the advertising battle?*
Blount: Naturally I don't want to say too much on that topic at the moment. There's a court action pending and we believe we are right in defending it. Our job is to try to ensure that we stick to not only the letter of the law, but the spirit of the law, because the law is designed to protect consumers and consumers are our customers.

AC: *The Opposition has accelerated its privatisation program. How well prepared are you for that?*
Blount: I don't necessarily believe there'll be a big difference as long as we're doing our job. I see you're smiling, but it's the truth. I'm not aware of the Opposition raising the privatisation issue any higher than it's already been raised with me privately.

AC: *I don't know what has been raised privately, but the election could mean the alternative Government has a privatisation taskforce in this building in March.*
Blount: Sure.

AC: *Are you prepared for the books to be opened and for due diligence to begin?*
Blount: Whoever owns us has every right to look at the books, whether it's the Government or somebody else. That's back to the point I've made that we're more than happy to go the Treasury, Finance, DOTAC or the Minister's Office and open our books.

AC: *In a press interview last year, you were quoted as saying AOTC was a $10 billion asset. Others believe it's worth $20 billion. Do you think that is a bit inflated?*
Blount: Well, if I was quoted, it was probably on turnover and not on shareowner value. I was not talking privatisation back then.

AC: *But even before you arrived you must have wondered whether privatisation was part of the agenda?*
Blount: I thought it might be at some point, although I'm not saying by that I'm for it or against it. I'm just saying that it's the mood. It's what's happening in the world.

AC: *Presumably it will complicate your life to cope with the merger, competition and privatisation all at the same time?*
Blount: It will make my life a little bit more complicated if, in fact, it happens. A few AOTC people at the top will spend a lot of time on it, but 99% won't even know it, unless they read it in the newspaper. They

will have the same job on Monday morning as they did on Friday night: To serve the customer better.

AC: *In negotiations with Optus over preselection and equal access Austel set the options as balloting versus canvassing and you accepted the balloting option.*
Blount: What's the difference? I can't tell the difference.

AC: *I had some trouble too, but wasn't one exercising choice through a ballot and the other was the default option?*
Blount: Well, all of it has to do with selling what you have to offer in the marketplace, whether it's balloting or canvassing. What I fought over, and I put my body across the train tracks, was that I was not willing to have all non-respondents to a ballot be allocated in the same percentage as those who voted. We won that. And I was not willing to give customer proprietary billing information to my competitor. We won that. Balloting to me is no more than marketing, and I say 'That's the sleeves out of my vest.' If they want balloting, they can have it.

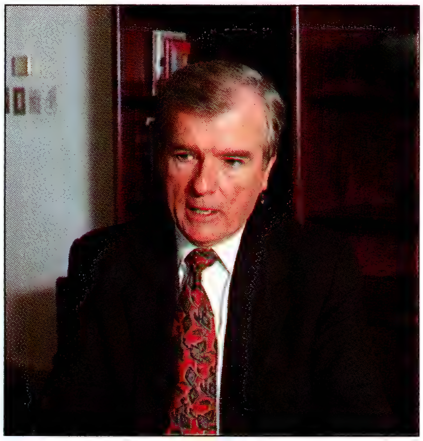
AC: *So you didn't see balloting as a watershed issue?*
Blount: No, I saw some of the issues surrounding balloting as watershed issues.

AC: *Doesn't the US go through a type of proportional allocation process?*
Blount: Yes, proportional allocation has taken place in the US. We have negotiated a better deal for Telecom here in Australia.

AC: *Was your senior management team split over whether to fight the balloting option?*
Blount: Liz, I cannot think of any issue where the management team is not split. That's the nature of a business. People are people. They have their own views. The issue is how you come out at the end.

AC: *But I'm told you were present when your Strategic Management Council voted 12:2 in favour of fighting against balloting.*
Blount: I don't remember that. Was there a difference of opinion? You bet. If there was not, I wouldn't have a good management team. What really makes a good team is that once a decision is made, they all march to that decision. That's what they're doing, therefore I feel really good about that management team.

AC: *What impact do you expect a third mobile operator to have on your business?*
Blount: It's too early to tell. The implications of the first competitive operator are that we're growing the market faster than we had projected. This is a prediction that I made when I first came on this job. We are in a pure resale mode at this point, so we have full visibility on what's happening in the market, and it's growing beyond our expectations.



AC: *But three mobile operators changes the game doesn't it? Aren't there only two in the large US markets?*
Blount: Yes, most of the time in the US you have a wireline and a non-wireline carrier. It's hard to assess, because there's not a lot of experience with three.

AC: *The third operator plans to use a Microcellular Network strategy to capture market share. Do you plan to match that?*
Blount: Well, microcellular is only worth something if you have so much volume in a given cell, you have to reduce the cell size, and switch between them faster in order to give you more capacity. We're abreast of that technology, though at this point we're not at all sure we need to go to it at the same speed that maybe some others are until we understand the implications of the supply-demand issues in the market. It's too early, frankly, to assess whether or not their particular thrust is something that we need to counter in a specific way.

AC: *Announcing the third mobile licensee, the Minister reaffirmed a timetable to phase out your AMPS network? How do you respond to that?*
Blount: I haven't heard that but we have a fairly significant investment in analogue mobile, and we don't have any particular plans to write that off in a very short timeframe other than what we already have scheduled in our depreciation tables.

AC: *What is a very short timeframe?*
Blount: In this kind of technology, I'd say five, six, seven or eight years is about the life.

AC: *What growth strategies are you pursuing offshore? Doug Campbell said recently the aim was to secure about $1.5 billion in offshore revenues by the mid 1990s.*
Blount: That's about right.

AC: *How will you reach that? I believe a globalisation strategy was considered by the Board at the December meeting.*
Blount: Yes, we had a two and half hour review and the strategy was adopted by the Board. Surprisingly to me, even though I did nine, 10 or 11 months of due diligence on the company before I came to this job, we are more successful offshore already than I thought. We either own or have equity in companies in probably some 25 countries, most in the Asia-Pacific. Our investment has been very guarded so far, but we do know that we have a lot of expertise recognised around the globe. I've been amazed at the number of offshore visitors that have come here willing to partner with us in their home countries to open up new markets.

AC: *Are these new markets in developing or developed countries?*
Blount: Most are in developing countries. In this region, we have three major pending initiatives now that I can't announce yet.

AC: *What do you mean by pending?*
Blount: I mean that we have bid, and we're waiting to hear. So we're in the final cut.

AC: *How many dollars do you need to invest to bring in $1.5 billion in revenue by the mid 1990s?*
Blount: Probably an equal amount of money, about a dollar for dollar.

AC: *I understood your Chairman advised the Minister last year that the offshore investment criteria include a payback period up to five years and 20% return after tax. Is that correct?*
Blount: Let me leave it this way with you. We want a payback in a reasonable timeframe, and the hurdle rate for getting investments approved has to be higher because of the risk involved in going offshore in general. If we were to buy a going business with a revenue stream and very little risk, then the hurdle rate could be a lot less because it depends on perceived risk.

AC: *Assuming these criteria, won't you need to invest more than $1.5 billion?*
Blount: You're assuming we're doing it alone. If we go in with partners, we don't have to invest that much. In fact, on some of our investments, we get a payback in two years. That's 50 cents on the dollar.

AC: *The offshore investment strategy has triggered some controversy with the Goldman Sachs report recommending it be cut back and ATUG has raised questions too. It's not an easy one.*
Blount: No, it's not easy and, as usual, there is no pat answer. Everything depends.

There's an artificial boundary between domestic and global that I don't find very helpful. We're going to invest wherever the best opportunities are. If it happens to be global, we'll do it there, and if it happens to be domestic, we'll do it there. I believe there is plenty of evidence to suggest we have ample opportunity to go offshore and make lots of money.

AC: *How do you intend to respond to competition from BT which, armed with the NSW Government contract, has said it will use Australia as its Asia-Pacific headquarters for expanding its Global Network Services in the region?*
Blount: There is big move afoot, not just in Australia, about whether certain carriers are going to go it alone around the world and try and provide full-scope services, particularly for multinational corporate customers, or whether they're going to do it in a strategic partnership mode. There's also the schizophrenia of being both a supplier and a competitor to some of those companies. Frankly, a lot of worldwide carriers are trying to decide whether they're fish or fowl: Are they going to be in a strategic partnership mode or go it alone like BT?

AC: *BT did try to get partners such as Deutsche Telekom and NTT in its Syncordia venture.*
Blount: Well, Syncordia is really a subsidiary, and I'm not sure how hard they tried. Anyway we're fully abreast of that . . .

AC: *What is your globalisation strategy to counter BT's plan to have sales and service people on the ground in another 15 Asian-Pacific countries by 1994?*
Blount: We have people in Asia-Pacific countries to that number today.

AC: *Really?*
Blount: I'm not saying we have as many people, but we have as many Asia-Pacific countries covered. The issues are how can we best serve multinational customers and what is the best way for us to achieve the same objective, given where we start from and our size and our location.

AC: *So will you go it alone?*
Blount: No, I can tell you that we're not going to go it alone. We're not big enough.

AC: *Which partner will you choose?*
Blount: I obviously cannot announce that. I can tell you that there are all kinds of meetings going on around the world on strategic alliances. I just got back from a worldwide trip in the last two months on this issue, and I'm leaving again on Sunday for a week or two. Things are happening.

AC: *Will you be going to January's Pacific Partners meeting of carriers in Hawaii?*
Blount: Yes, I'm co-hosting it with AT&T.

AC: *Did you ever go to the same meeting on behalf of AT&T?*
Blount: Yes.

AC: *What type of strategic partners do you need? Would you, for instance, choose another carrier or a computer company?*
Blount: We're looking for sets of skills. If we've got the right skill mix, we'll go after it whether it's another computer company or a PTT or whatever.

AC: *What type of expertise or skill mix do you need?*
Blount: We're going to partner with whomever we need to strategically align ourselves with to be successful in the marketplace.

AC: *But do you need to partner with another carrier?*
Blount: We certainly do not need additional carrier expertise, but we do need the access to customers that other potential carrier partners provide.

> *"To make a simplistic statement on how many staff there will be in 1995 is craziness. Do we have too many people for the size we are now? Yes, we do. What is the ultimate? I do not know."*

AC: *What are some of the big issues confronting you this year?*
Blount: The only big issue is to make sure this company becomes totally customer-focused and customer-dominated. If we do that, nothing else matters.

AC: *What about the staff? Can we expect more announcements on job cuts?*
Blount: We're not going to make an announcement. We're just going to size the organisation where we have to be sized. Let me back up, Liz, because it's really important. The only reason the 4,400 was ever announced was simple. Let's just take a hypothetical example. You've got a work group of 10 people. Every year, somebody holds up their hand and says I want to retire and we say 'Fine, good luck, goodbye, we wish you well,' and we get by with nine, but the work group stays. The next year, we get by with eight. That's the scenario we've been in for years. We had to announce the 4,400 because we, in effect, were vacating lots of locations, and the entire work group was being moved to another location and consolidated with other work groups.

AC: *So you don't plan to do that again?*
Blount: I'm not saying that we're not going to do it again. I'm saying there is a difference between taking attrition in existing work groups and closing operations. I will never say 'Never.' Superlatives, I have learned over 30 years, will get you in trouble every time.

AC: *I assume you won't do it just before an election?*
Blount: I don't know. I will do whatever it takes to get this business ready for competition. I'm here to safeguard shareholder value. My job's not a political job in the sense of worrying about who gets elected. My job is to create shareholder value.

AC: *But you're aware of shareholder sensitivities?*
Blount: Sure I am, Liz. But the issue here is that we're going to do whatever it takes to get this business competitive.

AC: *Doesn't the voluntary redundancy agreement cease at the end of January?*
Blount: That's right.

AC: *So will it be a different then?*
Blount: I don't know. It depends on how many volunteer to go and where.

AC: *Have you got any targets?*
Blount: We have financial targets.

AC: *What about staffing targets?*
Blount: No, I think it is a little narrow thinking to try to fix some magical number and say: 'This is it.' There is no magical number and there is no staff numbers target. We have to keep a close check on all our costs and, of course, when you have 75,000 employees — one of the country's biggest workforces — wages are a big part of your cost structure.

AC: *But surely jobs are important?*
Blount: Well, they are important. But you don't equate necessarily your investment or your dollars or your return on employees. There are lots of costs that don't relate to employees in this business.

AC: *Yet one of the oft-cited productivity comparisons with carriers such as BT is the number of access lines per employee.*
Blount: Sure, but there are about 20 dimensions of this problem. Growth is an issue; the right skill mix of employees is an issue; geographic location, how many people are willing to move to keep their job is another complexity; the size of the workforce and productivity are issues. To make a simplistic statement on how many staff there will be in 1995 is craziness. Do we have too many people for the size we are now? Yes, we do. What is the ultimate? I do not know. You see the worst thing we can do, Liz, is to cut staff arbitrarily and then wind up with a service crisis on our hands in a competitive market.

AC: *But are you trying to achieve a better ratio of employees per access line?*
Blount: Sure, we have benchmarks, we know where we've got to go, and we have plans to get there. But in terms of how many staff per line, that's not the issue. The real issue is cost per line. Let me back up on that. This is a fixation we've got in this industry. We're fixated on inputs, people per line, rather than on outputs, what we are delivering.

AC: *Yet this type of benchmarking is very fashionable.*

Blount: I know. But you've got to understand what companies are delivering on the output side, what is their shareowner value. You only get half the question answered when you look at inputs.

AC: *Aren't some benchmarks based on comparing apples with oranges?*

Blount: No, they're not, because we're looking at both inputs and outputs. But what you see reported in the press is inputs, you never see the outputs.

AC: *Is Telecom Industries likely to survive?*

Blount: We're going to divest of several parts of Telecom Industries and wind up with a much smaller electronics production outfit if the unions deliver what they say they're going to deliver in terms of world's best practice by July, 1993.

AC: *Are there plans to create new jobs through Pay TV for instance?*

Blount: The answer is that we always had plans for growth. We have a strategic plan in several areas including broadband to the home, and Pay TV is only a subset of that. That may bring new jobs to the industry, but it's not going to be the panacea. It's not going to create huge numbers of jobs. The offshore expansion, the hubbing in Australia, and certain of our multinationals will create jobs both here and abroad in the Asia-Pacific.

So the answer is yes, we're looking at ways to create new jobs. But is it going to be the panacea? I don't think so. I think our core business in 1995 is going to look very similar to the core business today.

AC: *Do you distinguish between core and peripheral business?*

Blount: My point is that the majority of our business is still going to be the same in 1995. So if you're looking for impact, leverage of jobs because we're creating a new industry or new offshoots of this industry, there will be some, but it's not going to be thousands and thousands.

AC: *Meanwhile you have a survey that shows staff morale is very low?*

Blount: Well, Liz, I'm the one that commissioned the study knowing full well what it was going to show. If it had shown anything different, I would have suspected the study. So it's not a surprise to me. I've been through these kinds of surveys at least a dozen times before. Everything is changing, everything these people grew up understanding.

AC: *In terms of leadership, how are you addressing this?*

Blount: First of all, you have to understand and get everybody else to understand that it's never going to be the same. It's a massive communications exercise and that's where it's going to force management to communicate with everybody like we never have before, face-to-face, not by newspaper article, not by letter, not by mass meetings but one-on-one. I'm doing that myself right now. I'm out talking to people by the hundreds, hour after hour.

More than that, we have to understand that there has been a social implied contract in this company for 60-70 years, that is, you sign on and there is an implied social contract that you have job security forever, no matter what. Now something has to take its place? What is that? We haven't defined it yet, but it cannot be job security forever in a competitive environment. We have to replace it with other implied contracts like, 'You come to work here, you grow, you learn a competitive industry, you get to have a good job, to learn new skills. Yes, there may be implied risk in the fact that we are a competitive industry. Employment is not guaranteed.' Look at the airlines worldwide.

AC: *What about the loyalty that comes with the implied promise of a lifetime career with one company? Wasn't that part of it?*

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Blount: Sure it was, but that brings baggage with it too. Everything has an offset. That baggage of complacency is not necessarily a good one either. You know, 'We're here forever, therefore, no matter what happens, we're okay.'

AC: *But surely you cannot get rid of this completely? Doesn't AT&T still have this 'baggage'?*
Blount: Sure. I'm not saying we're going to get rid of it. Job security is only one of 50 elements in that survey. There are other elements that need work just as badly. But job security becomes less of an issue if you communicate. We tend not to tell people what we know, and therefore they fear the worst.

AC: *Will you still be here if privatisation does occur?*
Blount: You bet I'll be here. I didn't come on some fixed term. I came to do a job, and when it's done, I'm going to leave.

AC: *When will the job be done?*
Blount: Okay, I'll tell you by reading out some headings. Successful conclusion of the merger; substantial progress toward becoming a totally focused customer organisation; marketing and commercial discipline in place equal to the engineering discipline, that means product, market, asset and process management, process re-engineering as a new way of life, lateral thinking and re-engineering all processes to focus on customers; complete redesign and implementation of financial and operational management control systems; treatment of employees with respect and dignity and, notwithstanding the trauma associated with major transformation, these employees see the company as a good place to work and their contributions and initiatives are welcomed and rewarded; enlightened and progressive relationships with the various unions even though much dislocation of staff is required in order to effectively compete. The management ranks of AOTC, while still needing much development, have a shared sense of the realities of their changed roles and most are excited and challenged by the opportunities . . .

AC: *Excuse me, but are these your goals?*
Blount: Yes, three years . . . considerable transformation of the cost structure from one characterised by high cost and high fixed cost to one that is moving aggressively towards world's best practice in terms of total unit cost and one in which there is a trajectory of improvement in conversion of fixed to variable cost; subject investment initiatives to a greater degree of scrutiny and rigour and prioritisation to ensure they are both consistent with the strategic direction of the company, that they are financially attractive, fully tracked and individually accountable; strengthen the senior team considerably during that timeframe; AOTC to establish very open, candid and professional relationships with all relevant governmental shareowner departments, agencies and commissions; develop and implement a coherent, rational and strategic plan for the next five years. That's when I'm going to be finished. That's when I'll declare victory.

AC: *Will you stay on after you've declared victory?*
Blount: I might. I'm 54 years old, Liz. I don't want to go to age 65. I want to retire.

AC: *I understand you like teaching?*
Blount: Yes, I'll probably teach Business Policy at one of the major US colleges when I leave. I have a couple of offers, so I suspect I'll do that part-time. I enjoy teaching here among the people I work with. I think I have something to offer in that regard, and so I'd like to share it.

Liz Fell is a freelance journalist and Senior Research Fellow at CIRCIT.

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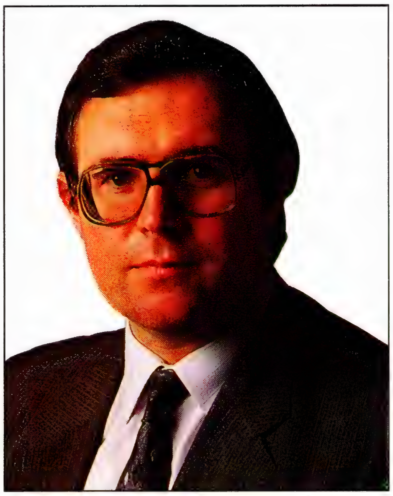


Tom Amos

Tariff Evolution

Do you have you five friends? What about dialing 1 for a discount? A socially led recovery or not, the coming months should see an evolution in both the marketing and presentation of telecommunication tariffs. Scrambling, mild panic or calculated marketplace response . . . only time and the bottom line will tell.

The potential tariff wars are in some ways quite unpredictable given that the marketplace is an evolving duopoly and in such instances competition usually rests upon services rather than price. After all, the commodity is all but the same so why discount? Over-reaction or perception that there is significant room to move?

The licence structure of the two dominant carriers, whilst by no means perfect, allows the non-dominant carrier to discount as it deems necessary but limits the dominant carrier in each market segment to keep within a narrow tariff boundary or reduce the overall tariff base to everyone, not just those targeted for discounts. The aim is clearly to keep the dominant carrier from using market power to obliterate the new entrant by only giving discounts on the competitive routes. There must, of course, be some give and take in such arrangements and the current selective discounting by Telecom reflects about the limit that may be taken by the dominant carrier without impinging on the basic rights of the second operator. After all, we are all interested in a discount or should I say an evolving cost base tariff structure.

De-averaging of prices and the requirement to meet up to CPI less 5.5% across the board decreases plus overall cost related pricing goals means that the discounts on, say, long haul trunk services, are balanced against short haul local customer access price rises. Provided the total basket meets the upper goals then it appears that everyone will be happy. De-averaging, for the unwashed, is simply allowing Telecom to reduce tariffs on well serviced routes without impacting the price cap.

But the lower price goal? Well not many considered that large decreases in price were possible further than, say, the basket price cap determined. It is bureaucratically considered that the volume element will in fact stop the dominant carrier from exerting undue market force by requiring that cross subsidisation across services is effectively limited by having a wide basket of services considered. There is simply no limit as to the price reductions possible with the current scheme which is good news for the users.

In essence, real price reductions below the price caps are currently possible with the benefit passed on to the consumer and user by way of overall lower tariffs. Re-balancing of Telecom long haul and short haul tariffs is also continuing at the same time along the trend started several years ago with cost related pricing (de-averaged prices) becoming an acceptable way of pricing. Of course the same commodity is still sold in the same marketplace for several different prices with apparent Government sanction. The provision of over three thousand prices for only several basic telecommunications commodities gives new meaning to the concept of product differentiation! Name shading for existing single colour services will be part of the new market montage.

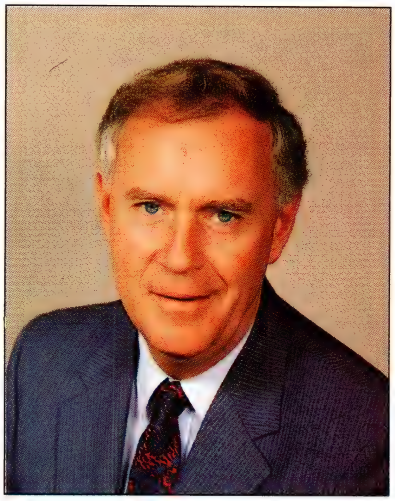
But what of the aspiring carriers? Over the last 12 months several overseas companies have entered the Australian marketplace some with more 'success' than others. None existed in this market guise before. Collectively the two successful Euro-based licence consortia have paid about $140 for each phone connected in Australia. Whilst this does not seem like a lot of money, it does have some impact on their ability to enter a discount war with infrastructure. This money needs at some stage to be recovered from the users through tariffs. The dues collected by the Government have sadly already left the industry. If you look at the licences granted, it is clear that it is in the interest of the second operator and potentially the third cellular operator is to discount as little as possible and gain market share on other grounds. Yet Telecom, has been targeting long distance and mobile areas for discount above that being operated by the second carrier. Discounting from an unexpected area!

Given both are only addressing the general consumer marketplace it would seem that the large discounts being offered by Telecom to selective groups and volume users could be reflected in rises up to the maximum cap in the basket areas. Alternatively, it may also mean across-the-board reductions for all tariffs and a lower profit, all being equal for Telecom and its owner. In fact, the way the cap is set up it doesn't prevent large discounting by the dominant carrier on a route-by-route and service-by-service basis provided the overall cap is not breached (then all prices are reduced). This of course translates into lower overall profits at a time when there is pressure by both political persuasions to fatten up the beast for a post election sale.

The second operator and the third mobile operator are at a significant disadvantage in the end play with the cap arrangements but whilst they are small and do not significantly impact revenue and tariff mixes they are effectively just noise until they migrate significant route traffic. The industry profitability shots are still called by Telecom. They are also saddled with paying back the purchase price. Once any in-roads into the basket revenues are made it will be a different game. Major discounts may then be a thing of the past while competition on a selective basis could ensure that the new entrants are on a very marginal basis for some time. The winners are potential users who can gain the benefit today of artificial competition whilst the new entrants are in start-up phase.

The questions of market power abuse, misleading advertising and general marketplace confusion will be but sideshows as the new regime continues to develop. One thing that is sure is that we are still a long way from cost related pricing and there is a long way to go. The tariff battle will be for domestic traffic and the high volume end. The concept of suppressed demand and more traffic for lower prices always tends to colour a good marketing presentation. Lets hope that the 10% across-the-board heads towards 20% soon . . . then again, what will the value of Telecom be with a reduced profitability? Get in quick . . . new friends can be quite valuable.

Tom Amos is a partner with telecommunications consulting engineers Amos Aked Swift.



Bill Melody

Privatising AOTC: Why and For Whom?

Now that privatisation is back on the telecommunication policy agenda, it is important to assess how this fits within the larger scheme of promoting sector development. The telecommunication infrastructure is seen as a platform for future growth in the Australian economy and exports of a wide range of telecommunication-based products and services.

The first round privatisation debate centred on Aussat and the second carrier license. The Government guaranteed about $800 million in Aussat debt in an unprofitable and deteriorating public company. The sale process was heavily influenced by the desire to create sufficient value in the second license to cover the Aussat debt. This was done by establishing duopoly protection until 1997, the most favourable conditions for second carrier entry of any country, and a regulatory mandate to ensure the success of competition (i.e. Optus) in the short term. These benefits were sufficient to permit certain obligations for investment, employment and industry development to be exacted from Optus as part of the package.

Whether this privatisation process will yield significant benefits for Australia is debatable. A licence fee to cover past government guaranteed debts, unsupported by asset values, is simply a form of taxation. This 'tax' raised Optus' entry costs and required both that competition be restricted and the stimulus for investment, employment and industry development be reduced. An economic assessment of the potential benefits and costs for the telecommunication sector, or the Australian economy, did not govern the policy decision. An inherited financial problem and a short term political agenda dictated a fundamental economic policy decision with significant long term consequences.

Now comes the possibility of AOTC privatisation. Is there a case for it? If so, will it follow the model of the second carrier licence? Will the ghost of Aussat debt haunt the AOTC privatisation?

The most fundamental reason to privatise AOTC is to obtain the enormous amounts of investment capital required to maintain an up-to-date telecommunication infrastructure and achieve significant offshore success. If AOTC is to fulfill its mandate, it must have access to capital on the most efficient and flexible terms possible. If, in the current environment the Government cannot provide this on-going funding, the sooner the financing options made possible by privatisation are opened to AOTC, the better. AOTC is likely to need new equity capital additions at regular intervals for the foreseeable future.

The privatisation process involves the sale of the government's existing equity ownership of AOTC. This will provide no new investment funds for AOTC and could limit the carrier's opportunities for raising new funds for some time after the sale — another reason to begin the privatisation process quickly. Given the enormous amount of capital involved, a long term plan providing for both privatisation and the raising of new investment capital simultaneously over a period of years is essential.

However, once again the temptation of short term political expediency will be great. If AOTC is sold for the highest price, presumably to permit the largest possible reduction in government debt, this will trade off a government financial windfall for a continuing long term restraint on telecommunication sector development, with knock-on effects for the economy and export opportunities. In addition, a higher price could be obtained if restrictions on future competition were maintained or extended, and a need for only weak regulation in the future could be agreed.

This approach to privatisation could be a re-run of the Aussat sale, but at the level of the Australian economy. It may not be the ghost of Aussat debt that dictates the transaction, but rather the ghost of government debt. In both cases, it would be making fundamental long term telecommunication sector policy decisions to compensate for past government financial problems, at the expense of future growth and export opportunities.

There are essentially two possible methods of privatising AOTC — competitive bidding as was done in New Zealand and with the Optus, or a public stock flotation as was done in both the United Kingdom and Japan.

Competitive bidding is easier, and many experts agree, more likely to obtain a higher price under normal market conditions. But this would require that bidding be opened to the major international players; it would result in almost certain loss of Australian control over AOTC; and it would require a major compromise of Australia's telecommunication-based export ambitions. Moreover, given the global recession and the many telecommunication privatisations occurring around the world, it is much more a buyer's than a seller's market. The private market valuation may be well below the long term public value of the AOTC resource.

A public float may induce many Australians to become investors for the first time. NTT prohibited foreign investment in its first stock issue. In Australia the probable size of the public float alone indicates a need to tap all potential Australian sources of funding, including employees and subscribers. In some countries, special opportunities for subscriber investment have provided a significant source of new capital. In addition, private placements of minority shareholdings with Australian investment institutions such as superannuation funds are likely to be needed and a desirable investment for the institutions. Foreign sales could be permitted in second and subsequent stock issues, with limitations on ownership concentration, and the government keeping the proverbial golden share.

A public flotation could be designed to raise capital both for the government (privatisation of its existing ownership) and for AOTC's new investment needs at the same time. A planned program of phased periodic stock issues over a number of years would permit the capital to be raised for both purposes, make it more likely the capital markets could digest the issues efficiently, and promote rather than constrain Australia's policy for a dynamic telecommunication sector in a global information economy.

Professor Bill Melody is the Director of the Centre for International Research on Communication and Information Technologies.

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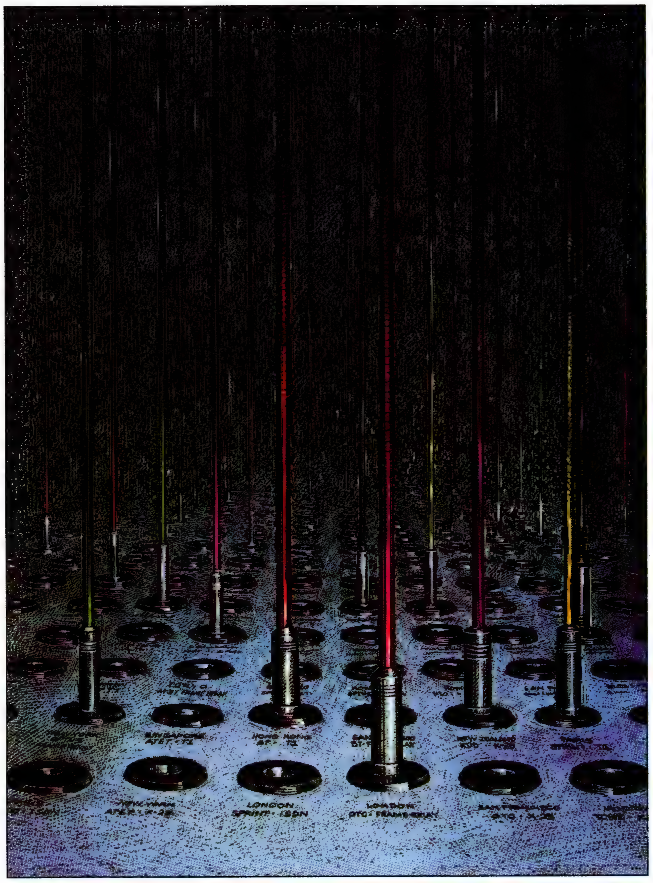
Going Global: Players, Products and Perspectives

Times have changed for Australian business users of international communications. Thanks to deregulation there is now an ever-growing list of alternative carriers and service providers.

If you are the Communications Manager for a large multinational company based in Australia, you may have noticed that things have started getting a little complicated in the last six or seven years. In the early 1980s you were able to approach OTC with a requirement for virtually any traditional international telecommunications service and return to your office feeling reasonably confident that no one was offering anything better or cheaper from Australia. From the mid to late 1980s, you may have noticed that while OTC still had what you thought was a monopoly to provide international services, a small number of other competing players who had traditionally offered international computer bureau services were now offering services like e-mail and EDI. In 1989, you would have noticed the Government resign itself to what many would consider to be the inevitable, and legislate to allow providers other than OTC to supply a range of defined domestic and international services under the umbrella of value added services (VAS). Today, as a result of legislation introduced in 1991, you can go shopping for something as simple as an international leased data circuit and return to your office carrying two brief cases of brochures from service providers guaranteeing to supply the best deal in town.

A multinational corporation in Australia today can establish overseas communications by utilising services provided via any one or more of at least 16 resident providers. Migrating from an era where telecommunications services were provided almost exclusively by Telecom and OTC, since 1989 the Government has implemented a number of reforms based on a policy which is intended to maintain effective regulation and at the same time ensure that Australia has the most liberal resale regime in the world. In terms of the Government's direction the new environment in Australia is intended to provide better utilisation of network capacity, a greater variety of service providers, more competitive pricing, and greater innovation in the use of technology.

While there exists scope for further deregulation, Australia is, at present, virtually unmatched in the extent to which the provision of international telecommunications services has been liberalised and Australian customers today can enjoy the benefits of choosing from a broad and innovative range of services and providers.



The Rules

Since their inception, organisations such as the ITU, the CCITT, CCIR, ISO and others have worked towards rationalising international telecommunications and introducing technical, operational and regulatory standards for the benefit of the entire global community. While governments in most countries are receptive to the efforts and aims of these organisations, there has always been a tendency for domestic interests to play an influential role. In the case of telecommunications, this often results in each country ultimately ending up with its own derivative of the international rules.

While this, at times, can make it quite awkward for international service providers (SPs), over the past few years a number have managed to hurdle parochial differences in resale conditions, public network interconnection and value added service definitions, to roll

International Service Provision: The Players

While OTC and Optus retain exclusive rights to supply the physical links to and from Australia, deregulation has helped usher in an ever-growing number of international service providers.

AT&T

American Telephone and Telegraph (AT&T) has provided international telecommunications services since 1930. Based in New York, the organisation today has a direct presence in 37 countries and has been established in Australia since 1981. As well as NCR, its major business units presently operating in Australia are: Consumer Communications Services; Network Systems; Network Cable Systems; EasyLink Services; Business Communications Systems; and Unix System Laboratories.

Carrier services offered include a number of calling cards and value added network products supplied by AT&T EasyLink Services. On 17 November 1992, AT&T signed a joint venture agreement with Paxus and Qantek to establish 'AT&T EasyLink Services Australia Ltd.' The new company will provide a range of service offerings including EDI, enhanced facsimile, electronic mail, telex and information services.

AAP TELECOMMUNICATIONS

AAP Telecommunications (AAPT) was formed in 1990 as a joint venture between AAP Information Services Pty Ltd, MCI Communications Corporation (the second largest long line carrier in the US) and the Todd Corporation Ltd (which together with MCI is a significant shareholder in New Zealand's second carrier, Clear Communications). In Australia, AAPT offers international voice services to all overseas destinations as an extension of the domestic services 'City Dial' and 'First Choice.' With the scheduled introduction of the VPN service 'Vantage,' an interface will be provided to the MCI 'Vnet' service in the US, which will provide an international extension of the feature set available in both countries.

BT AUSTRALASIA

BT (formerly British Telecom) has been the trading name of British Telecommunications Plc since 2 April, 1991. BT Australasia Pty Ltd (BTA) is a wholly-owned subsidiary of BT and has been operating in Australia since 1987. BTA's activities since then have included:

- Establishment of a research and development facility in Sydney (1989);
- The sale of electronic equipment, including dealing room systems, cabling components and data networking hardware; and
- The provision of a range of domestic and international telecommunications services including: A managed data network service (GNS); international voice and data services incorporating end-to-end integrated systems management provided by BT subsidiary Syncordia; and videoconferencing, electronic messaging, frame relay and others.

In addition, BTA has recently won the contract to implement and manage the NSW State Government's telecommunications network.

GE INFORMATION SERVICES

GE Information Services has been established in Australia since 1968. Prior to the mid-1980s, its international product portfolio included a range of general business communications services associated with centralised teleprocessing applications and included facilities like general ledger, financial consolidation and manufacturing systems. More recently GEIS has aimed at the delivery of cost effective and tailored solutions for the entire 'information services value chain,' which includes transmission, networking, processing, enablers, applications and systems integration.

IBM INFORMATION NETWORK

The IBM Information Network is a managed and meshed SNA network offering users electronic mail, EDI and computer system interconnection and management services. The network represents a significant investment by IBM in equipment, processing centres, telecommunications lines and support staff and today, provides access from over 50 countries.

INFOLINK NETWORK SERVICES

Infolink Network Services Pty Ltd (INS) is a domestic and international provider of managed data network services. The Australian portion of the INS network was originally established in 1984 by Mayne Nickless as Maynenet. INS is a joint venture of Infolink Group Ltd (45%) and Singapore Telecom (55%). INS offers a variety of value added services including e-mail, Store and Forward facsimile and file transfer.

INFONET AUSTRALIA

Established in the US in 1971 by Computer Sciences Corporation (CSC), Infonet has grown to become a significant provider of international managed data network services. Telecom Australia became a part owner of Infonet in January 1989 as a result of CSC forming Infonet Services Corporation (1988) and offering equity to telecommunications carriers. Prior to the acquisition, the Australian service had been run by Computer Sciences Australia.

Infonet currently operates in Australia as an arms-length business unit of AOTC and is responsible for the sales, marketing, operation and support for Infonet within Australia and New Zealand. Its service offerings enable clients to seamlessly link LANs, terminals, PCs and host computers using a wide variety of protocols and speeds on a global one stop shop basis.

MCI INTERNATIONAL

MCI International Inc. (MCII) was the first alternative international voice communications carrier in the US, having been formed in 1983 as a subsidiary of MCI Communications Corporation following the purchase of Western Union International from the Xerox in 1982. It presently has offices located in 53 countries.

Services currently provided in Australia by MCII include public switched voice (direct connection to US operators using 'MCI Call USA'), calling card (MCI Card) and e-mail (MCI Mail). MCII is also the largest shareholder in Infonet (25%).

OTC

OTC was established via the *Overseas Telecommunications Act, 1946* as a statutory authority responsible for international services between Australia and other countries. Following proclamation of the *Australian and Overseas Telecommunications Corporation (AOTC) Act, 1991* OTC was merged with Telecom Australia.

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out network and service offerings which span the globe.

In Australia, the rules governing the provision of international telecommunications services by SPs are embodied in the *Telecommunications Act, 1991* (the Act) and Austel's new International Service Providers Class Licence (ISPCL). By adopting a 'class licence' approach, Austel has provided the freedom and flexibility for SPs to offer a wide range of eligible international services within a fairly clearly defined framework. Overall administration is simplified in that there is no need for every service to be registered with Austel.

While the Act supersedes previous legislation, the new ISPCL permits operators who have established networks and offered services under the 1989 'Private Network Services Class Licence' and 'Value Added Services Class Licence' to continue operating without interruption. Where a service provider is already providing services within the guidelines of either or both of the latter two licences there is no need to re-enrol with Austel. In accordance with the ISPCL, only a supplier of:

- A public switched service with single ended interconnection;
- A private satellite service subject to the Radcom Direction;
- A service utilising an indefeasible rights of use (IRU) in a cable; or
- A public switched service with double-ended interconnection,

must enrol with Austel as a supplier of such a service.

Under the new regime instituted by the Act, it is no longer appropriate to refer to a value added service in the legal sense (despite earlier comments relating to automatic entitlement to service provision under the old 'VAS Class Licence'). As a generalisation, there are at present only two types of international service providers in Australia. These are:

- 'General Carriers' (OTC and Optus) who under section 90 of the Act have the exclusive right to install and maintain 'reserved line links' (reserved international infrastructure); and
- Anyone else (since the same restrictions apply to all other players at the Australian end for international 'services.'

In terms of new opportunities for SPs, while the ISPCL offers new and unprecedented opportunities for SPs wishing to simply resell international capacity without adding value, there appears to be little else the licence offers providers which hasn't been offered already under earlier licences.

As of late 1992 only a handful of SPs had enrolled under the ISPCL including BT Australasia, Infolink Network Services and PacRim Financial Network. Each of these SPs prior to 1992 had already supplied services under the VAS Class Licence and it appears that ISPCL enrolment was undertaken primarily as a means of gearing up for

The name and logo for OTC Australia has been retained since the merger, and OTC continues to provide a wide range of international public and private voice, data, image and telecommunications management services. In addition, international managed data network services are provided by OTC through 'SprintNet via OTC' and via AOTC's shareholding in Infonet.

OPTUS COMMUNICATIONS

Optus Communications was selected by the Australian Government to become Australia's second domestic and international telecommunications carrier in November 1991. While the carrier has plans to introduce an extensive range of international voice and data services, its portfolio, at this stage is limited to international public switched voice, and dedicated voice and data lines to New Zealand.

PACRIM FINANCIAL NETWORK

PacRim was established in Australia in August 1991 by the Trade Wind Group of Companies with a charter to provide network services required in the financial markets by banks, brokers, exchanges and major corporates. The PacRim network is at present, hubbed in Sydney and comprises linked nodes in Australia, NZ, US, UK, Hong Kong and Singapore. PacRim provides a range of end-to-end managed services covering voice, data and facsimile.

SATURN GLOBAL NETWORK

Saturn Global Network (SGN) is a wholly owned subsidiary of the international broking firm M. W. Marshall. Headquartered in Sydney, SGN commenced operating in August 1992, with a network based on Ascom Timeplex multiplexers which delivers service to over 30 cities in 12 countries. With a focus on the requirements of multinational companies, SGN has a product portfolio which includes dedicated analogue and digital voice lines, facsimile, low to high speed data services, LAN connectivity and frame relay services.

SITA/SCITOR

SITA is the world's largest private telecommunications network. Originally established in 1949 as a non-profit cooperative to provide safe and secure telecommunications services for the aviation industry, SITA has grown to include in its membership a wide range of air transport related bodies, and has established a number of commercial subsidiaries. Its SCITOR subsidiary was created with a charter to provide telecommunications and related services similar to those offered by SITA to any industry group or customer.

The SITA Group's network operates in 200 countries and territories in the world, comprises 800 communication centres, service access points for over 1,300 cities around the world and two major data processing centres, with planning underway for a third. SITA has been operating in Australia since 1964.

SPRINT INTERNATIONAL

The company 'Sprint' was formed in the US in 1986 as a joint venture between GTE Corporation and United Telecommunications Inc. Sprint International is a Sprint subsidiary and was formed in January 1990 from the merger of Telenet Communications Corporation and Sprint's international voice division. In Australia, Sprint International has operated since May 1991, and currently provides a range of international services including Sprint FONCARD, electronic mail (SprintMail) and network design, implementation and project management services as well as being a provider of the Telenet range of X.25 and frame relay switching systems. Sprint is closely linked with Telecom and OTC at present through its 'SprintNet via OTC' and 'GVPN' service partnerships.

SPRINTNET VIA OTC

SprintNet via OTC (launched in October 1991) is a global value added network providing a range of international data services. In Australia, the service offering is a result of an OTC/Sprint International partnership formed in 1991 and the network in Australia is presently 100% owned by Telecom. Local access nodes presently situated in Sydney, Melbourne, Brisbane, Canberra, Adelaide and Perth, are based on packet switching technology and provide virtual private services on a shared backbone.

possible opportunities rather than as a means to launch a preconceived product. While the ISPCL provides new latitude for international resale from Australia, it appears unlikely that the licence will, by itself, also provide the catalyst for flooding the telecommunications market with a hitherto captive and unexploited range of international services.

With respect to resale of capacity from Australia, there are, in accordance with the Act, ISPCL and Ministerial Directions at present, no reciprocity conditions associated with establishment of an Australian-end half circuit. In liberalising telecommunications, the Government now permits international resale irrespective of the status of telecommunications regulation in the correspondent country, accounting rates between carriers and/or SPs in Australia and overseas, or any other matter which may have a business impact on operating in Australia. Overall, SPs are required simply to operate in accordance with the ISPCL irrespective of conditions that exist at the distant end of a network. SPs, however, that do not operate in accordance with ISPCL conditions can be disconnected in the 'public interest.'

At this stage, the FCC in the US has permitted some international resale on a 'reciprocity' basis and has recently allowed resale to Canada. In the UK, Oftel has liberalised international resale to the point where it is permitted on an 'equivalence' basis, with 'equivalence' incorporating a range of conditions. It also appears that New Zealand will insist on reciprocity.

Foreign Carriers

According to the regulatory framework now in place, there should clearly be only two types of international operators in Australia, that is, 'general carriers' and 'others.' While this is true in the legal sense, the background of the various players coupled with ownership arrangements and strategic alliances, have somewhat blurred the clarity which might otherwise have been. This is particularly true in the case of foreign carriers operating in Australia.

In August 1992 we were informed of AT&T's success in selling the first international T1 satellite link between Australia and the US to Qantas. While some would applaud AT&T's business acumen in closing the sale, others with an eye for regulation may wonder at AT&T's claim. In the normal course of events, the physical international half of such a circuit would be provided and maintained by OTC (or Optus in the future). AT&T doesn't own a satellite earth station in Australia and there would be little commercial sense in reselling the Australian end of such a large chunk of bandwidth in one go. Why have press releases on the sale emphasised AT&T's involvement and said so little about OTC's? It may be well worth examining whether foreign carriers receive any 'special' privileges in Australia.

There are at present six foreign international carriers with a shop-front presence in Australia. The carriers are AT&T (US), MCI International (US), BT (UK), Sprint International (US), KDD (Japan) and TCNZ (New Zealand). In addition, there are a number of carriers not included in this group which are represented in Australia by various agencies.

The operations of each foreign carrier in Australia are summarised in Table 1 on page 64. With respect to operating in Australia, all foreign carrier offices provide local customer support and carrier liaison on behalf of the overseas parent. In addition, there are generally a number of bilateral strategic alliances which have been made between foreign carriers and Australia's General Carriers.

One example of such an alliance is the 'One Stop Shop' agreement which OTC presently has with 14 international carriers. In the majority of cases the agreements are reciprocal and provide for:

- Single point ordering;
- Single point billing; and
- Single point fault reporting.

One Stop Shop provides one means for non-Australian carriers to offer, as far as the customer is concerned, a complete international private line circuit (even though OTC or Optus continues to physically supply the Australian-end half circuit).

According to AT&T, the claim to have sold a T1 circuit to Qantas is not necessarily linked with One Stop Shop and is linked more readily with AT&T offering a global network service.

Alliances

Until the early 1980s, international telecommunications was a gentlemanly undertaking based on carriers working together in a monopoly environment. With the large scale entry over the past eight years of a number of new carriers into the international services arena, we now have a situation where customers have a far greater choice of service provider. As a consequence numerous bilat-

TABLE 1: INTERNATIONAL CARRIERS OPERATING IN AUSTRALIA

	AT&T	BT	KDD	MCI	OTC	OPTUS
Full Company Name in Australia	AT&T Australia Ltd	BT Australasia Pty Ltd	Kokusai Denshin Denwa Co Ltd	MCI International (Aust)	OTC Australia	Optus Communications
Home Country of Operation	US	UK	Japan	US	Australia	Australia
Australian 'General Carrier'[1.]	No	No	No	No	Yes	Yes
VAS/VANs Provider in Australia	Yes, AT&T EasyLink services	Yes. GNS, Syncordia	No	Yes	Yes	Not yet
Equipment Vendor in Australia	Yes	Yes	No	No	Yes	No
Customer Support & Carrier Liaison in Australia	Yes	Yes	Yes	Yes	Yes	Yes
One Stop Shop Agreement with Australian General Carrier	Yes (OTC)	Yes (OTC)	Yes (OTC)	Yes (OTC)	N/A	N/A
Research & Development Facilities in Australia	No	Yes	No	No	Yes	No
INTERNATIONAL CONSUMER VOICE SERVICES SUPPLIED IN AUSTRALIA						
Telephone (Public)	No	No	No	No	Yes	Yes
Country Direct to Australia (Operator Assisted Calls)	No[3.]	No[3.]	No[3.]	No[3.]	Yes	Not yet
International Calling Card	AT&T Calling Card	BT Chargecard	KDD Hello Card	MCI Card	OTC Call Card & Telecom Telecard	Not yet
INTERNATIONAL BUSINESS VOICE SERVICES SUPPLIED IN AUSTRALIA						
International Toll Free	No	No	No	No	Yes	Not yet
Dedicated Voice Circuits	See Note 2.	See Note 2.	See Note 2.	See Note 2.	Yes	NZ now. Globally from April 1993
INTERNATIONAL BUSINESS DATA SERVICES SUPPLIED IN AUSTRALIA						
Packet Switched	No	No	No	Yes. Via Global Access	OTC Data Access and SprintNet via OTC	Not yet
Dedicated Data Services	See Note 2.	GNS and See Note 2.	See Note 2.	See Note 2.	Yes	NZ now. Globally from April 1993
Store and Forward Facsimile	Yes. AT&T EasyLink services	No	No	Via MCI Mail	OTC EasyFax & FaxLink	Not yet
E-Mail	Yes. AT&T EasyLink services	Yes, via GNS	No	MCI Mail	X.400 Message Handling	Not yet
EDI	Yes. AT&T EasyLink services	Yes, via GNS	No	No	OTC Electronic Trading	Not yet
Videoconferencing	No	Yes, Private Room services	No	No	Public & Private Room Services	Not yet
Database Access	Yes. AT&T EasyLink services	Yes, via GNS	No	Yes, Dow Jones via MCI Mail	OTC IntelNet	Not yet
Frame Relay	No	1Q.1993	No	No	Not yet	Not yet
IVPN	No (GSDN in US)	No. (International FeatureNet in UK)	No. (Virnet in Japan)	No. (Vnet in US)	OTC Call Plan	Not yet
Switched Data (via ISDN)	No	No	No	No	Yes	Not yet

Notes:
1. A 'General Carrier' in Australia is able, in accordance with the *Telecommunications Act, 1991* to provide 'Reserved Line Links' (Reserved Infrastructure).
2. The complete end-to-end international service is sometimes offered by non-Australian carriers, as an agency, through a 'One Stop Shop' agreement with OTC.
3. This service is provided in the reverse international direction by non-Australian carriers in their home country.

eral/multilateral alliances have been established between carriers to:

- Limit the overall loss of market share;
- Strengthen market dominance in particular product areas; and
- More adequately address the international enterprise networking requirements of multinational companies.

As an example of an alliance created to preserve market share a particular affiliation of international carriers in the Pacific Region has been meeting on a regular basis over a number of years to develop marketing strategies and exchange carrier information.

The alliance, which has come to be known as 'Pacific Partners,' includes OTC, AT&T (US), AT&T (Hong Kong), ITA (Taiwan), KDD (Japan), KTA (Korea), PLDT (Philippines), Singapore Telecom, Telecom Malaysia and TNZI (New Zealand). There are no alliance-specific commercial agreements between members, and carriers are not precluded from establishing other bilateral or multilateral partnerships with non-alliance carriers. Outcomes of Pacific Partner meetings include the rationalising of a number of One Stop Shop agreements between carriers and the establishment of closer ties to customers, who at times have been invited to attend the forums.

Technology has also, at times, cemented ties between international carriers. Taking advantage of the somewhat dilatory nature of various international technical standards organisations, a number of carrier alliances have been established on the basis of adopting a particular proprietary technology platform. Such a case in recent times has been the adoption of the Sprint International virtual private networking solution called Global Virtual Private Network (GVPN) by a number of international carriers (including OTC) to create the GVPN Alliance (a subset of the GLOBAL FON Alliance). Additional information on IVPN and GVPN can be

	SPRINT	TCNZ
	Sprint International Pty Ltd	TCNZ Australia Pty Ltd
	US	New Zealand
	No	No
	Yes	No
	Yes	No
	Yes	Yes
	Yes (OTC)	Yes (OTC)
	No	No
	No	No
	No[3]	No3.
	Sprint FONCARD	Telecom New Zealand Calling Card and Global Direct
	No	No
	Note b	Note b
	No	No
	Note b	Note b
	Global SprintFax	No
	SprintMail	No
	No	No
	No	No
	No	No
	Hardware vendor and support	No
	No. GVPN in US)	No. (WorldNet in NZ)
	No	No

found later in this article and in an earlier article (see 'Simplifying Global Communications with IVPNs,' *Australian Communications*, December/January 1991/92).

With the entry of international value added network (IVAN) providers, international carriers were suddenly faced with the dilemma of competing against organisations supporting and managing a single global network. While the carrier response was, by no means, instantaneous, the competition did create a new awareness of the overall networking needs of multinationals and the requirement to guarantee network performance on more than just a bilateral basis between carriers. In addition there has been a complementary move by carriers to begin selectively addressing the communications requirements of multinational corporations in terms of application.

One result of the new initiatives has been the creation of the Financial Network Association (FNA). FNA has been established as a joint venture of 12 international carriers (including OTC) to service the particular international networking requirements of the financial community. Services are offered by FNA on the basis of One Stop Shop, and include global connectivity and management for voice, data, imaging and applications. Global performance standards apply, and where required by the customer, service level agreements provide for the imposition of financial penalties upon failure to meet performance guarantees. In Australia, the service is marketed as 'OTC Teleconnect' and was launched in October 1992. At this stage OTC plans to extend the initial service offering, which was limited primarily to dedicated voice and data services, by providing a number of enhanced services in the first quarter of 1993.

The Products

For international telecommunications, there is no doubt that the driving force behind the development and introduction of new services has come from the business user. The following sections examine the international service offerings of providers in Australia in terms of voice and data against consumer and business requirements.

Public Telephone Service

Despite the hive of activity associated with the introduction of new and innovative telecommunications products by Australia's international carriers, the public telephone service (without any frills) continues to generate the bulk of carrier revenue. International public telephone is one of the few services targeted by carriers on the consumer (as well as business) market and can be used in either the automatic or operator assisted mode. In its unenhanced form, international public telephony is only offered in Australia by OTC and Optus. A recent (1986) innovation to the service (provided by OTC and called 'Australia Direct') provides the facility for Australians travelling overseas to make a reverse charge call back to Australia via an Australian operator (available in 31 countries at present). The same service is provided in the reverse direction by all of the foreign carriers operating in Australia.

International Calling Card

International Calling Card services are presently offered in Australia by a number of carriers as shown in Table 1.

With the exception of the Telecom Telecard and the Telecom New Zealand Calling Card (with Global Direct) which both offer calling to multiple overseas countries from Australia, use of the cards for international calls, at present, is restricted to between Australia and the US for the cards supplied by US carriers, and Australia and the UK for the BT-supplied card.

For all calling cards, an account nominated by the user is debited for call charges while some of the cards allow debiting of a credit card. In addition, some of the calling cards can be used in a pre-paid mode.

International Toll Free

A business in Australia may elect to have an International Toll Free telephone number. The service, which is only provided by OTC in Australia at this stage, enables overseas clients, or potential clients, to contact the business in Australia at no charge to the caller. The owner of the toll free service pays OTC an annual rental and the IDD cost of all calls answered. A reciprocal service is provided in the opposite direction by non-Australian carriers.

Dedicated Voice Circuits

International lines providing a dedicated point-to-point connection for voice communications are available today from a number of suppliers and in a variety of flavours. Upon provision of the service users are at liberty to utilise the dedicated lines for voice or low speed data communications. While analogue lines are still provided to some international destinations which are not yet serviced digitally, carriers and service providers in Australia now generally utilise digital transmission to offer various levels of voice quality at encoded digital speeds of 8Kbps to 64Kbps. Analogue lines used for the carriage of low speed data can be provided at standard grade or as a premium service for higher data speeds with the line conditioned to CCITT Rec M.1020.

IVPN

From their inception, International Virtual Private Network (IVPN) services have offered users of the public switched telephone network the benefits of:

- Call volume discounts;
- A highly robust network;
- Management reporting; and
- Extending a common set of calling features across an internationally dispersed set of PABXs, Small Business Systems (SBSs) and discrete telephones from different vendors.

Some of the specific features available to IVPN users include:

- Abbreviated dialling and a private numbering plan;
- Call forwarding;
- Automatic call-back;
- The receipt of calling line identity (CLI);
- Conference calling; and
- Customised announcements.

The feature set available to a user is dependent both on the local implementation of an IVPN service by, say, a carrier, and any national regulatory factors that may influence functionality (e.g. restrictions on forwarding CLI).

In Australia, at present, IVPN services are provided by OTC using internally de-

TABLE 2: INTERNATIONAL MANAGED VOICE & DATA NETWORK & SERVICE PROVIDERS IN AUSTRALIA

	AAPT	AT&T	BRITISH TELECOM	GEIS
Trading Name	AAP Telecommunications	AT&T EasyLink Services	GNS, Syncordia	GE Information Services
Ownership	AAP, MCI, Todd Corp.	AT&T, Paxus, Qantek	BT PLC	GE Information Services
Australian Operator	AAP Telecommunications	AT&T EasyLink Services Australia	BT Australia	GE Information Services
Began in Australia	1990	January '92. Joint venture AT&T, Paxus, Qantek November '92	1984	1973
Single Source for Global Network	No	Yes (local number)	Yes	Yes
Gateways Available to Other VANs	No	X.400 and proprietary interconnect	Yes	X.400 and proprietary interconnect
Gateways Available to PDNs in Australia	No interface to packet networks	Yes	Infolink and AOTC	Austpac and Data Access
Local Support Provided Internationally	Australia and US only	Local support in 24 countries	Yes, in over 26 countries	Local support in 33 countries
Security Provisions	N/A	Extensive including user ID and password verification	Innate in T2 algorithms. Extensive range of passwords, etc.	Extensive Password and User ID, up to 2 levels with application password, plus 'Watchword' handheld authorisation
Dial-Up Rates	N/A	Async/sync 2400bps, 9600bps	Async 9.6Kbps	Async 9.6Kbps with MNP error checking
Leased-Line Rates	All standard speeds to 64Kbps to NZ only	To 64Kbps	To 64Kbps	To 64Kbps
LAN/WAN Interconnection	No	Yes, premise based interconnect available	Yes, via X.25 and frame relay	Currently deploying capability
Frame Relay	No	N/A	Yes, in 11 countries	In deployment
Protocols Supported	Voice only	Async, X.25, SNA/SDLC, SNI, BSC, RJE, X.400 and LAN/WAN protocols	All common protocols are encapsulated in T2 Tymnet	Async, X.25, SNA, SNI, and X.400, 3780 and 2780
Tele-Processing	No	No	Extensive	Interactive and batch. MVS/XA, UNIX and VM operating systems
EDI	No	AT&T EasyLink EDI, and EDICT	X.400, EDIFACT, X.12 and special cargo handling EDI	EDI*EXPRESS, PC, Unix, and mainframe/midrange software, consulting and mailbox
E-mail	No	AT&T Mail	Yes, via BT's Messaging Service	Yes, plus various customised systems and X.400
Voice	IVPN & Value Added Voice services	No	Not available	Under consideration
Store and Forward Facsimile	No	AT&T Enhanced Fax	Not available	EDI, e-mail and other applications to facsimile
Video or Imaging	No	No	Not available	Some Image available
Database Access	No	Yes	Multiple databases	Yes, domestic and international. In-house, third party
End-to-End Network Management	Yes, between Australia and New Zealand only	Not provided by EasyLink	Yes, via BT's integrated network management programme	Yes, via Managed Data Network Service
Help-Desk Local	24 hours/7 days	24 hours/7 days	24 hours/7 days	8:00am to 8:00pm, backed up by global desk out of hours
Help-Desk Global	Yes, via MCI	24 hours	24 hours	24 hours
Centralised Billing	Single billing	Single billing	Single billing, flexible	Local, centralised or end-user billing facility
Stated Performance Objectives	Yes	Contractually negotiated	Standard package	Yes
Service Performance Guarantees	Negotiated	Contractually negotiated	Standard service level agreements	Yes, have done in contracts
Promoted Features: No 1	Business focused. Voice and data solutions	Global messaging service. Local access	Service 82 of top Times 100 companies in UK, and half US Fortune 500	Provider of business solutions integrating in key financial, trade and transport, and retail industries
Promoted Features: No 2	Comprehensive and detailed billing capabilities	Single product approach: EDI, EFax, e-mail, Information Services	Flexibility of protocol support	World leader in EDI/Mail/ Business Messaging services and implementation methodologies
Promoted Features: No 3	Access to state of art VPN capabilities	Multimedia capability	In-built network security is part of the protocol	Support for a wide range of protocols and industry applications

TABLE 2: INTERNATIONAL MANAGED VOICE & DATA NETWORK & SERVICE PROVIDERS IN AUSTRALIA

IBM	INFOLINK	INFONET	PACRIM FINANCIAL NETWORK	SATURN GLOBAL NETWORK
IBM Information Network	Infolink Network	Infonet	PacRim Financial Network	SGN
IBM	Singapore Telecom; Infolink Australia	100% owned by PTTs including MCI (25%), AOTC (5.38%), KDD (5.0%)	Trade Wind Group	100% owned by money brokers M. W. Marshall. (M. W. Marshall is 29%-owned by BT)
IBM Australia Ltd	Infolink Network Services Pty Ltd	AOTC	PacRim Financial Network	SGN Pty Ltd
1989	1984 (Originally called MayneNet)	1971	1991 (August)	1992 (August)
Yes	Yes	Yes	Yes	Yes
Yes	To the BT Global Network Service and to PAXUS EDI	At X.400 level and Compuserve gateway	Not yet	Frame relay (I.122) gateway available
Austpac and Data Access	Austpac and Data Access	Austpac and Data Access	Austpac and Data Access	Austpac and Data Access
Over 50 countries	In most countries	Local support in 46 countries	Local Support provided in Aust, NZ, UK, USA, HK & SNA	Local support in 12 countries
Multiple security layers	Tymnet network supervisor ensures no imposter nodes. User IDs, user privileges and passwords	User ID, password, symbolic addressing, closed user groups	Multiple levels including user IDs and passwords	Password hierarchy, network segmentation
Up to 9.6Kbps with MNP. Async and SNA	Async to 9.6Kbps with MNP protection. X.32 to 2.4Kbps	Async 9.6Kbps V.32 with MNP if required and 9.6Kbps X.25.	Async 9.6Kbps	Async to 19.2Kbps
To 64Kbps. Special requests for higher leased line rates can also be considered	To 64Kbps	64Kbps X.25 and up to 2Mbps LAN connection	2.4 to 786Kbps	1.2Kbps to N x 64Kbps
Yes, particularly IBM local area networks	Via X.25 gateways	Native LAN protocols available in 27 countries	Available in 6 countries	Yes, via X.25 and frame relay
Under investigation	Currently under review	Early 1993	Not yet	Yes
Async, SNA, SNI, X.25, X.400	Async IBM Honeywell (VIP), X.25 over Tymnet	Async, X.25, 3270 BSC, SNA/SDLC and all popular LAN/WAN protocols	All common protocols	All common. SNMP Management Agent
Yes	Have own local processing bureau	Remote computing service bureau	No	No
ANSI X.12, UN/TDI, UN/EDIFACT, UCS	Via gateway to PAXUS only	NOTICE EDI with X.12 and EDIFACT	No	No
X.400	Dialcom	NOTICE (Proprietary). NOTICE 400 (X.400)	No	Not yet
Under investigation	Currently under review	Private voice on request	Yes, 8 to 64Kbps voice	Yes
Yes, facility of IBM Mail Exchange	Yes	Via electronic messaging	Yes 'FlexiFax' service	No
Under investigation	No	Planned	No	Not yet
IBMLink and O/S databases	Yes, international and domestic	Yes	No	Yes, via NMS
Yes	Yes, end-to-end monitoring	Yes	Yes, via multiple NMS	Yes, via multiple NMS
6.00am to 6.00pm Monday to Friday. 24 hour/7 days incident reporting and call out	7:00am to 6:00pm on site. 24 hours/7 days	24 hours/7 days	8:00am to 6:00pm	Yes, 7:00am to 9:00pm
24 hours	24 hours	24 hours	24 hours	24 hours
Yes	Single billing with full usage details	Single billing with complete breakdown monthly	Local, central or end-to-end billing. Totally flexible	Single billing
Negotiable — responsive to customer requirements	Yes	For fault restoration and net availability	Yes	Contractually negotiated
Negotiable — responsive to customer requirements	Yes, if required	Negotiable	Yes, negotiated	Contractually negotiated
Customised solutions	Superior customer service and managed end-to-end network	Global reach through associated PTTs and high degree of local support	Excellent customer service with single point of contact	Major infrastructure existing. Ease of access
Connectivity — Worldwide Electronic Mail, Fax, EDI	Extensive Australian coverage	High-speed and wide range of services, X.25, LAN, Messaging, etc.	Reliable voice and data services with end-to-end network management	Flexibility of services provided
Multiprotocol support International applications and databases	Australian remote processing services through bureau	Inherent network redundancy and one stop shopping	Value added services at competitive rates	Cost effective 'Managed Network'

TABLE 2: INTERNATIONAL MANAGED VOICE & DATA NETWORK & SERVICE PROVIDERS IN AUSTRALIA

	SITA	SPRINTNET via OTC
Trading Name	SCITOR, a subsidiary of SITA (the Societe Internationale de Telecommunications Aeronautiques)	SprintNet via OTC
Ownership	SITA Airline Cooperative	OTC & Sprint International (Partnership)
Australian Operator	SITA	Telecom Plus
Began in Australia	1964	1991 (November)
Single Source for Global Network	Yes. World's largest private network	Yes
Gateways Available to Other VANs	Available via X.400. Gateways also to aviation applications (Computer Reservation Systems) and other services (e.g. Tradegate)	Other X.400
Gateways Available to PDNs in Australia	To Austpac if required by customer	To Austpac and Data Access
Local Support Provided Internationally	Local support in 200 countries	Local support in 28 countries
Security Provisions	Extensive. Including unique identifiers	Via Network User Identifier (NUI) and Telenet Access Management Systems (TAMS)
Dial-Up Rates	To 9.6Kbps	Async 9.6Kbps with MNP protection, X.25 private dial-up to 9.6Kbps
Leased-Line Rates	To 64Kbps	To 64Kbps
LAN/WAN Interconnection	Via X.25 and frame relay where appropriate	Via X.25 at present
Frame Relay	Available in Australia from 2Q.1993	Available in Australia during 1993
Protocols Supported	X.25, X.28, X.32, X.400, IBM SNA and airline protocols with TCP/IP soon	All common protocols encapsulated in X.25, IBM protocols and X.400
Tele-Processing	Specific airline processing (e.g. airline reservations)	Not available
EDI	ANSI X.12 and EDIFACT and special X.400 now under development	Via Telecom Plus services
E-mail	SITAtex, X.400 and conversion services (e.g. DISOSS to UNIXMAIL)	Via Telecom Plus services
Voice	Private voice is available on request	Under investigation
Store and Forward Facsimile	Via electronic messaging	Via Telecom Plus services
Video or Imaging	Videoconferencing under investigation	Under investigation
Database Access	Airline specific	Yes
End-to-End Network Management	Yes	Yes
Help-Desk Local	24 hours/7 days	24 hours/7 days
Help-Desk Global	24 hours	24 hours
Centralised Billing	Single billing with detailed breakdown	Single billing
Stated Performance Objectives	Yes. Contract specific	Yes, exceeds or meets all CCITT standards
Service Performance Guarantees	Negotiable	Negotiable
Promoted Features: No 1	World's largest network, now not just for airlines. Full features available widely	Local service and support for global business communications
Promoted Features: No 2	One stop shop for network establishment and maintenance	Economic value added network traffic carriage for a wide range of services
Promoted Features: No 3	Strong local consultancy and training support	Hybrid communication networks — including seamless integration with other Telecom Australia provided services

veloped intelligent node architecture. GVPN functionality will be available in Australia from the second quarter 1993, and will complement the feature set available from OTC's present IVPN offering by providing users with the transmission of high speed switched data (at n x 64Kbps), CLI, Conference Calling, Automatic Call-back and Accounting Codes. OTC's offer of these additional features stems from its membership in the GVPN Alliance, which includes a number of international carriers such as Sprint International, Hong Kong Telecom, Mercury Communications, Teleglobe, PTT Netherlands and Swedish Telecom International, and adoption of the alliance hardware and software platform.

Plans by AAP to introduce a competing IVPN service called Access Plus Vantage in 1992 have been intentionally deferred until early this year while a new billing system provided by MCI is tested and commissioned in Australia.

In addition, it now appears that BT is also planning to introduce a global VPN service with a node in Australia. While details are still sketchy, BT's 'Project Cyclone' has been described as 'a $US1.5 billion global network that would have access in 20 cities.'

Dates for interconnection of IVPN between Australia and the rest of the world are shown in Table 3 on page 70.

Packet Switched Services

Packet switched services based on X.25 standards continue to provide a popular and cost effective means of communicating internationally at low data speeds (typically to 2.4Kbps or 9.6Kbps). Users generally have the choice of communicating via:

- A dedicated X.25 connection;
- A dial-up X.28 connection; or
- A dial-up X.32 connection which offers error correction features of X.25 on the customer tail circuit and multiple connection channels if required.

While basic elements of the X.25 protocol have changed little over the years, a new emphasis on adding value to network services (by IVAN providers in particular) has introduced in recent times a range of enhanced packet switched services which offer:

- Error correction and compression protocols (MNP and V.42) via smartmodems provided on X.28 dial-up connections;
- Conversion/gateway facilities for extended communication coverage;
- Pseudo-addressing which enables a user to specify origin and destination points of a communication session via a simple character string in place of cumbersome X.121 addresses; and
- Comprehensive management reporting and invoice breakdown facilities.

While fast packet switching services utilising technologies such as frame relay, ATM and SDH are beginning to appear it is expected that international applications requiring X.25 functionality will continue to exist well into the 1990s.

'Over 70% of Australia's top 1000 companies are now using EDI'*

EDI has been ignored for too long. Australia's top companies are now starting to realise that the long-term benefits of implementing EDI far outweigh the initial investment costs. Their managers are now finding that EDI leads to significant cost reductions and productivity gains, as well as better business and trading relationships.

Electronic Data Interchange (EDI), or paperless trading, is a computer-to-computer data transaction - which saves on paper, time, labour and postage. It replaces the purchasing cycle's paper transactions from quotation to payment and replaces the paper transactions in other business processes.
EDI can reduce inventory costs in the purchasing cycle by up to 90%.

The Department of Administrative Services, in conjunction with Standards Australia and the EDI Council of Australia (EDICA), has developed the *EDI... A Better Way* kit. It has been produced to eliminate the confusion and technical mystery surrounding EDI. The kit clearly explains terms, technology and practices used in EDI. It consists of an overview booklet; two videos; a handbook which explains terms, standards, systems and business issues; and an interactive presentation on computer disk.

If you wish to purchase the ***EDI... A Better Way*** kit, or if you would like more information, please contact Standards Australia Marketing Services on (02) 963 4111, or fax us on (02) 959 3896.

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*Coopers & Lybrand survey of top 1000 companies - 'Electronic Data Interchange in Australia' - as referenced in *Australian Communications*, September 1992.

TABLE 3: IVPN INTERCONNECTION TIMETABLE

	Australia — OTC	Australia — AAP	Canada — Teleglobe	Hong Kong — HKTI	Japan — KDD	New Zealand — TNZI	Singapore — TS	UK — BTI	UK — Mercury	USA — AT&T	USA — MCII	USA — Sprint Int	France — FT	Sweden — STI	Netherlands — PTT	Italy — Italcable
Australia — OTC		●	2Q.93	❑	❑	❑	❑	❑	❑	❑	❑	❑	1Q.93	2Q.93	1Q.93	❑
Australia — AAP	●		■	■	■	■	■	■	■	■	❑	■	■	■	■	■
Canada — Teleglobe	2Q.93	■		❑‡	2Q.93	■	4Q.93	❑	❑‡	■	■	■	2Q.93	1Q.93	1Q.93	1Q.93
Hong Kong — HKTI	❑	■	❑‡		❑	■	❑	1993	❑‡	❑	❑	❑‡	1993	■	❑‡	1993
Japan — KDD	❑	■	❍	❑		❍	❑	❑	❑	❑	❑	❑	❑	❍	❍	❑
New Zealand — TNZI	❑	❍	❍	3Q.93	2Q.93		❍	1Q.93	3Q.93	1Q.93	2Q.93	2Q.93	❍	❍	❍	❍
Singapore — TS	❑	■	■	4Q.92	❑	■		2Q.93	2Q.93	❑	4Q.92	■	2Q.93	■	1Q.93	2Q.93
UK — BTI	❑	■	❑	2Q.93	❑	1Q.93	1Q.93		■	❑	❑	❑	❑	❑	4Q.92	2Q.93
UK — Mercury	❑	■	❑‡	❑‡	❑	■	1Q.93	■		❑	❑	❑‡	1Q.93	2Q.93	❑‡	3Q.93
USA — AT&T	❑	■	❑	❑	❑	❑	❑	❑	❑		■	■	❑	❑	❑	❑
USA — MCII	❑	4Q.92	■	❑	❑	1Q.93	❑	❑	❑	■		■	❑	1Q.93	❑	❑
USA — Sprint Int	❑	■	❑‡	❑‡	❑	4Q.93	❑	❑	❑‡	■	■		❑	4Q.92	❑‡	❑
France — FT	❑	■	4Q.92	1Q.93	❑	■	1Q.93	❑	❑	❑	❑	❑		■	❑	1Q.93
Sweden — FTI	1Q.93	■	1Q.93	2Q.93	1Q.93	■	■	❑	1Q.93	❑	4Q.92	4Q.92	1Q.93		❑‡	2Q.93
Netherlands — PTT	❑	■	❑‡	❑‡	❑	■	■	❑	❑‡	❑	❑	❑‡	❑	❑		■
Italy — Italcable	❑	■	❑	2Q.93	❑	■	❑	■	■	❑	❑	❑	■	■	■	

Note: Horizontal rows portray plans of each carrier, some of which may not be bilaterally agreed at this stage

❑ = Interconnection in place
❍ = Under Consideration
■ = No plan at this stage for interconnection
‡ = Existing GVPN connection
● = Connection provided for 'Access' only

Inter-Personal Messaging

For the international business user of telecommunications, the dream of being able to send a message to another person anywhere in the world using a personal name, telephone number, address or company title and being guaranteed that the distant party has received and read the message, is still some way into the future. Services today such as e-mail, voice mail, telex and facsimile which utilise the store and forward capabilities of X.400-based systems and which relate to person-to-person communication (not person-to-computer or computer-to-computer), have been grouped by the CCITT under the banner of Inter-Personal Messaging or IPM. IPM services will ultimately offer:

- The ability to carry a content-independent payload;
- Gateways to any existing (present or future) IPM messaging service;
- Addressing facilities based on distributed, but globally accessible, directory systems;
- High security, including message receipt verification and audit trails; and
- Easy access.

While international organisations today have made significant progress in developing standards such as the X.400 series for electronic messaging and X.500 for electronic directory facilities to partly cater for the above, there is still a significant way to go to before network intelligence capable of fully supporting the above functionality exists and the demand for such services cost justifies their full practical implementation.

Electronic mail is a typical example of an IPM application awaiting widespread acceptance in the user community. Some multinationals have elected to carry e-mail messages (chiefly for in-house use) on private international networks, while others have chosen to adopt the network service offerings of IVAN providers or international carriers to gain global coverage. Nevertheless, while the adoption of X.400 standards by all SPs has provided the platform for offering gateways to virtually any proprietary e-mail implementation, the international business community has yet to embrace its benefits.

Electronic Data Interchange

While a number of SPs have been offering EDI services based on proprietary implementations, for many years, the adoption of X.400 standards for the electronic message envelope (protocol for transferring the message) and content, has led to rapid deployment of EDI systems by IVAN providers and carriers. In March 1991, the final link in standardising end-to-end communication of EDI messages was realised when the X.435 standard (also known as P-EDI) which specifies how EDI documents are to be encapsulated as X.400 electronic mail messages, was ratified by the CCITT.

It is expected that the majority of providers will have EDI implementations based on X.400 (1988) and P-EDI in the next two years. As it is today, there are already a number of IVAN providers and carriers interworking EDI via X.400 gateways.

International ISDN

In the early 1980s ISDN appeared to offer unprecedented opportunities for the provision of new services, the standardisation of interface protocols and the rationalisation of domestic and international carrier networks. With the burgeoning penetration of digital network infrastructure around the world ISDN offered the ideal enabling platform for

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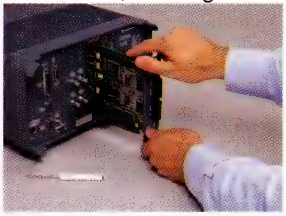

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providing a range of telecommunications services based on switched or semi-permanent digital connections. In reality, four years after widely accepted international standards for ISDN had been produced and ratified by the CCITT (the 1984 standards where largely incomplete) we have:

- A variety of implementations and service offerings from ISDNs provided by domestic carriers around the world:
- A slower than expected take-up of domestic and international ISDN services worldwide;
- Numerous incompatibilities between international/international and domestic/international ISDN implementations, a number of which only now are starting to be resolved; and
- A limited portfolio of international ISDN services which today comprise only basic switched voice and various applications for switched 64Kbps.

In recent times, European political leaders have been hard at work on attempting to placate a variety of interest groups while domestically implementing resolutions of the Maastricht Treaty for the unification of Europe. The implementation of international ISDN, while perhaps striking less of an emotional chord with the public, is providing no less a level of complexity. International ISDN provides the mechanism for internationally interconnecting domestic ISDNs and transparently passing ISDN features which have been supplied to users by domestic carriers. While international standards should theoretically provide a logical and smooth path for facilitating interconnection, there are a number of basic factors which have in practice, complicated the establishment of international ISDN networks. In summary they are:

- The fact that the technical standards themselves are very complicated;
- That an end-to-end ISDN network comprises three categories of technical standards and end-to-end compatibility. The three categories are:
  1. The Primary or Basic Rate interface to the user;
  2. The ISDN standard adopted for interworking domestic exchanges with domestic exchanges and domestic exchanges with international exchanges (domestic ISDN standards are the international standards adapted and modified by a domestic carrier to meet national requirements); and
  3. The international ISDN standard;
- Time and budgetary constraints of carriers and equipment vendors.

The establishment of a CCITT Signalling System No 7 (C7) network between Australia (OTC) and the UK (British Telecom International) in early 1988, constituted the world's first inter-continental and second international ISDN connection. (The author was responsible for managing the establishment of the network from the Australian end). The network initially carried only telephone traffic and the first commercial call was put through from Australia to the UK at 7:00pm, 26 January 1988. Between 1988 and November 1992 while OTC has established international C7 networks to an additional 15 countries, the functionality provided by international ISDN connections has remained largely unchanged, with the exception that an international switched 64Kbps service has been offered using a feature available on OTC's initial implementation of C7 signalling. The history of international ISDN for virtually every other international carrier in the world replicates the OTC scenario.

The existing 'OTC Switched Digital' service coupled with the development of customer premises equipment able to aggregate discrete 64Kbps channels to provide n x 64Kbps circuits, provides scope for the introduction of a number of useful international telecommunications services, including:

- Backup for digital leases and disaster recovery;
- Videoconferencing and other imaging applications;
- Transmission of 7KHz and higher quality audio; and
- High speed file transfer.

While these services have been available now for a number of years between Australia and the relevant country overseas, there has been little progress made internationally in implementing any 'Supplementary Services' which were specified in the 1988 CCITT Recommendations Q.761 to Q.764. In fact, while international carriers endeavoured in intervening years to provide additional ISDN functionality, incompatibilities in many areas became so serious that a new CCITT Recommendation Q.767 entitled 'Application of the ISDN User Part of CCITT Signalling System No. 7 for International ISDN Interconnections' was developed in order to reconcile difficulties being experienced. Technically, the new supplementary services which the Recommendation will support include:

- Calling Line Identity Presentation (CLIP) and Restriction (CLIR);
- Connected Line Presentation (COLP) and Restriction (COLR);
- Closed User Group (CUG);
- User-to-User Service 1 (UU1), which enables user-to-user signals to be sent during call set-up;
- Sub-addressing; and
- Terminal portability.

International ISDN networks capable of supporting these services have been established, to date, between AT&T (US), BT (UK), KDD (Japan) and Teleglobe (Canada). At this stage, OTC has tested successfully to a number of international carriers and is presently rationalising its domestic interconnection to the Australian domestic network prior to launching any new international service. The domestic interconnection is planned to occur by mid-1993, and OTC expects to be connected via the new signalling system to about 30 countries in the next 18 months to two years.

Managed Data Network Services

As an alternative somewhere between private management of an international private network and total outsourcing, a multinational may choose to utilise the services offered by a Managed Data Network Service (MDNS) provider. All SPs listed in Table 2 on page 66 provide some form of MDNS. With the exception of AAPT, whose service is limited to simply managing data links between Australia and NZ, SPs rely on the economies of scale inherent to large virtual private networks to pass on cost benefits as savings to users of their management and network provisioning services.

While users would typically have a unique set of reasons for choosing the MDNS option, obvious advantages in adopting the service include:

- The ability to forego major capital investment in network infrastructure for the short or long term;
- The ability to access small international sites that don't justify the establishment of dedicated links;
- The benefit of leaving network equipment upgrade and migration issues in the hands of the provider; and
- The benefit of interfacing with a single provider for billing, network reconfigurations and network management.

While most MDNS providers today offer low speed networks based on X.25 or SNA, the successful introduction of frame relay will ultimately benefit the user, with a network offering capable of supporting high speed, bursty data traffic.

Frame Relay

Frame relay developed from a requirement to carry low to high speed bursty data traffic over high quality transmission links. Development of frame relay protocols began with individual vendors, moved to the Frame Relay Forum (patronised largely by vendors of frame relay products) and culminated in ANSI then the CCITT developing a number of specifications including ANSI T.617, T.1618 and CCITT Rec. I.122, I.233, I.370, I.372, Q.922 and Q.933.

In its ultimate deployment, frame relay will be characterised by high speed multiplexing and multi-cast capabilities and will offer the option for either dedicated or switched access via ISDN. Most service providers today are positioning the frame relay product to offer flexible interconnection of LANs. At this time in Australia, a number of carriers and IVAN providers have just offered or are on the verge of offering PVC mode frame relay services at access speeds ranging from 64Kbps to 2Mbps.

George Bakunowicz is an Associate and Business Manager, International Telecommunications, with Consultel Australia.

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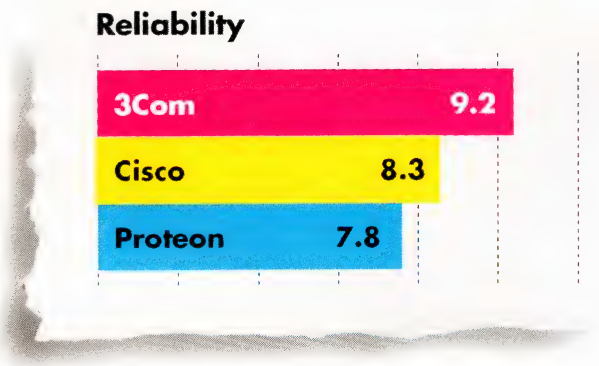
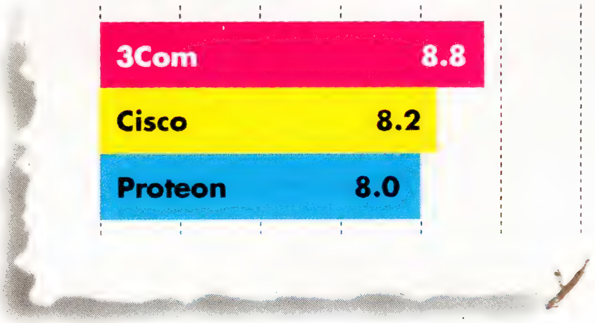


In a recent Buyers' Scorecard Survey by Computerworld *magazine, network managers rated leading bridge/routers. 3Com's NETBuilder® was rated Most Reliable, ahead of the market leader.*

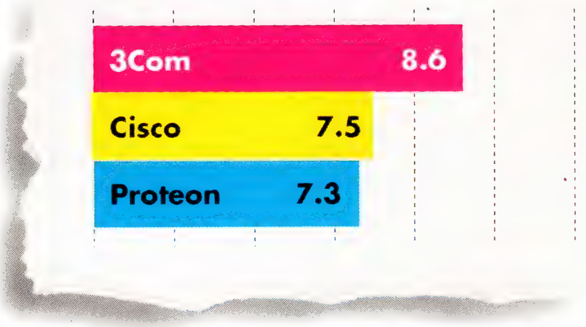
Performance



The Computerworld *survey also rated NETBuilder highest for Performance. In another recent study — this one by Harvard University — NETBuilder II was 60.1% faster than the nearest competitor for FDDI routing.*

3Com, Pacific House, Third Avenue, Globe Park, Marlow-on-Thames, Bucks SL7 1YL. ©1992 3Com Corp. (408) 764-5000. 3Com, NETBuilder and Networks That Go the Distance are trademarks of 3Com Corp. ©1992 by CW Publishing, Inc., Framingham, MA 01701 – reprinted from *Computerworld,* May 18, 1992.

Responsiveness of vendor service



In fact, NETBuilder got the highest ratings in 11 of 14 categories. That included Value, Physical Design, and Responsiveness and Quality of Vendor Service and Support.

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In Part II of our examination of the wide area networking solutions on offer from Australian vendors, Brian White takes a detailed look at how each addressed the networking issues.

Part I of this article (in the December/January 1992-93 edition of Australian Communications) provided an overview of the responses provided by nine vendors to a Request For Information (RFI) outlining the requirements of a fictitious company (AusComms Pty Ltd). This month we conclude the analysis with a feature-by-feature look at the specific functions provided by six of the respondents by explaining each vendor's approach and identifying the main differences between solutions.

The main objective in this month's analysis is to compare the specific approaches of each vendor for a variety of functional categories. Even if a vendor does not supply all the products in its solution, its approach indicates the company's understanding of the technical issues involved. For this reason, the analysis that follows has depended largely on the manner in which the vendors responded to the specific questions of the RFI and the schedules.

We found last month that although no vendor had a perfect solution on all counts, each of the nine vendors had something of merit for serious consideration. However, three of the original nine vendors — Timeplex, Sun and Retix — did not provide enough detail for some important questions or schedules so we've shortlisted six of the vendors — 3Com, Bull HN, Com Tech, Interlink, NetComm and Ungermann-Bass — for inclusion in this month's analysis. This is not to say that the three other vendors are not able to perform the project as set out in the RFI. For example, Timeplex has a very strong hardware range for integrated LAN and WAN solutions, and in a real tender would seek the assistance of external software specialists to execute the project. Sun also has a wide range of interoperability solutions based on its flexible workstation hardware and many connectivity software applications, but for this RFI, most of the products in its solution were from third parties.

Below we analyse interoperability for 10 client/server combinations where the three clients are Macintoshes, PCs and Unix workstations, and the four hosts are NetWare Servers, VAXes, Unix workstations and IBM-C (IBM plug compatible) mainframes. The trivial combinations of PC-to-NetWare and Unix-to-Unix were not treated. We've also taken a look at WAN features, reliability and performance, physical and hardware interface issues and network management.

Mac-to-NetWare Server

All six vendors agree on the use of Novell's NetWare For Macintosh NetWare Loadable Module (NLM) option on the NetWare servers, which allows the NetWare server to act as a server for Macs. This means that the AppleTalk Filing Protocol (AFP) is used between Macs and NetWare 3.11 servers rather than TCP/IP or Novell's IPX/SPX. This gives the Macs access to NetWare files and printer services and also allows other NetWare clients to access Macintosh printers.

At the physical layer, the solutions vary between AppleTalk and Ethernet media. On the one hand, Ethernet gives better raw performance and does not require an Ethernet/AppleTalk gateway, but it isn't the native LAN solution for Macintoshes. 3Com converts

TABLE 1: INTEROPERABILITY EVALUATION SUMMARY

CLIENT	HOST	3COM	BULL	COM TECH	INTERLINK	NETCOMM	U-B
APPLE MACINTOSH	NetWare Server	NetWare/Mac	NetWare/Mac	NetWare/Mac	NetWare/Mac	NetWare/Mac	NetWare/Mac
UNIX W/S	NetWare Server	Portable NetWare	NetWare NFS	NetWare NFS	NetWare NFS	NetWare NFS	NetWare NFS
PC	VAX Host	3Com TCP (PC) TCP/IP (VAX)	Work/DOS TES (VAX)	TES (VAX)	TES (VAX)	Work/DOS & Spry	NetWare/VMS
MACINTOSH	VAX Host	3rd Party LAT software	Work/Mac TCP/IP	None	TCP/IP on VAX	Work/DOS	TCP/IP on VAX
UNIX W/S	VAX Host	Telnet FT	DECnet-Ultrix TCP/IP	I/TCP on VAX	NetWare/VMS	TCP/IP	TCP/IP
DOS PC	Unix W/S	3Com TCP on PC	Work/DOS	Work/DOS & NetWare NFS	Work/DOS & TCP/IP	Work/DOS	GARP Gateway
MACINTOSH	Unix W/S	NCSA	Work/Mac	Work/Mac	Work/Mac & TCP/IP	Work/Mac	MaxTalk module MacUWS
DOS PC	IBM-C Host	TN3270 (PC) TN3270 (IBM-C)	3270/LAN & DPX-20	3270/LAN & NetWare/SAA	Wildcard	Win3270 Netway 2000	3270/LAN NetWare/SAA
MACINTOSH	IBM-C Host	TCP/IP (IBM-C)	Work/Mac DPX-20	3270/LAN + NetWare/SAA	Wildcard	Mac3270 Netway 2000	Netway Gateway
UNIX W/S	IBM-C Host	TCP/IP (IBM-C)	DPX/20 (IP/SNA gw)	None	Wildcard Open	None	Telnet 3270 TCP/IP (MVS)

NetWare/Mac = Novell NetWare for Macintosh
NetWare/VMS = Novell NetWare for VMS
NetWare/SAA = Novell NetWare for SAA
Spry = Spry Concurrent
NCSA = Public Domain Telnet
3270/LAN = Novell 3270 LAN Workstation
DPX-20 = Bull DPX-20 SNA Gateway
Netway 2000 = Netway 2000 SNA gateway
Mac3270 = Mac Netway Advanced 3270 software for Macintoshes
Work/DOS = LAN Workplace for DOS
Win3270 = 3270 emulation software for PC
Work/MAC = LAN Workplace for Macintosh
Networth = Dedicated Networth Application Engine for high demand

AppleTalk to FDDI using its NetBuilder II, before going into its LinkBuilder Hub. Bull uses a LocalTalk card on a NetWare server, while Com Tech connects the Macs to the AppleTalk/Ethernet router in the SynOptics hub. NetComm uses the Etherway router/gateway, a standalone device which routes between LocalTalk and Ethernet. U-B uses the MaxTalk module in the Access/One which acts as a gateway to the backbone.

Unix-to-NetWare Server

No solution was given for a Unix client to log into a NetWare server using IPX/SPX, but it is possible to be an NFS client using NetWare NFS on the NetWare server. This gives the Unix client NFS file sharing facilities with the NetWare server and also allows the Unix client to print to NetWare print queues. As a full implementation of NFS, the Unix client is therefore able to exploit NFS file and record locking and also to share its files with DOS and Macintosh Novell NetWare clients.

TABLE 2: WAN FEATURES

	3COM	BULL	COM TECH	INTERLINK	U-B
WAN DEVICE	NetBuilder	NetBuilder	3800 Remote Router Module	Netrix #1-ISS	Access/One
ISDN SWITCHED	Via ISDN Terminal Adaptor	N/S	Manual	Future	Via ISDN Terminal Adaptor
MODEM DIAL-UP	Next Release	☐	☐	Sync or X.32	Early 1993
FRAME RELAY STANDARDS	1,2,3,4,5	3	1,2,3,4,5	1,2,3,4,5	N/S
FRAME RELAY FUNCTIONS	1,2,3,5	N/S	1,2,3,4	1,2,3,4	N/S
MULTIPLEXER FEATURES	1,6	1,5,6	1,3,5,6	1,2, 5 (X.25 only),6	1
PHYSICAL WAN LINKS/NODE	1 - 7	8	4	800	20
MAX NODES IN NETWORK	Unlimited	N/A	Unlimited	1000	Unlimited
MAX LOGICAL CHANNELS/LINK	Unlimited	Protocol Dependant	Unlimited	4096	Protocol Dependant
MAX NODE DELAY	150 us	200 ms	N/S	20 ms	N/S

Frame Relay Standards: **1.** = T1.606 **2.** = T1.606 Addendum **3.** = T1.617 **4.** = T1.618 **5.** = LMI
Frame Relay Functions: **1.** = Forward Explicit Congestion Notification
2. = Backward Explicit Congestion Notification **3.** = Discard Eligibility
4. = Switched Virtual Circuit **5.** = Permanent Virtual Circuit
Multiplexer Features: **1.** = Load Sharing **2.** = Inverse Multiplexing **3.** = ISDN B-Channel Aggregation
4. = X.50 Rate Adaption **5.** = Local Cross Connect **6.** = Alternate Routing

☐ = Yes N/S = Not Specified

NetWare NFS was the solution suggested by all vendors except 3Com which suggested Portable NetWare, without any information as to its functionality or OEM source.

PC-to-VAX

The issues here are: *a).* Whether to use DECnet or TCP/IP; and *b).* The overhead placed on the VAX.

3Com suggests that the VAX should run TCP/IP and that the PCs can use 3Com's TCP package (for Telnet and FTP). This is an acceptable alternative to using DECnet, especially if TCP/IP is suggested as the common protocol platform for the WAN. TCP/IP on the VAX replaces the time-sensitive LAT (Digital's Local Area Transport protocol) with Telnet, which suits the lower speed WAN links. This would be less complex and faster than compression or encapsulation.

On the other hand, Com Tech and Interlink propose TES (Terminal Emulation Service) on the VAX, which adds IPX/SPX to the VAX for terminal access using Kermit (which is bundled with TES) or any other emulation package which supports INT-14. Kermit is also suggested for file transfers. U-B goes further by suggesting NetWare for VMS, which includes the TES capability, but also adds NetWare server features to the VAX. This is a good answer if one overlooks

TABLE 3: PROTOCOL FEATURES

	3COM	BULL	COM TECH	INTERLINK	NETCOMM	U-B
LAN BRIDGING	1,2,3,4	1,2,3,4	1,2,3,4	3	1	1,2,3
LAT	Bridged	☐	☐	■	☐	☐
TCP/IP	☐	☐	☐	☐	☐	☐
PPP	☐	☐	☐	■	☐	☐
DECnet IV	☐	☐	☐	■	☐	☐
SDLC	No	DPX-20	☐	☐	☐	Via Server
LU 6.2	Bridged	DPX-20	☐	☐	☐	■
NetBIOS	Bridged	■	☐	☐	☐	Bridged
IPX	☐	☐	☐	☐	☐	☐
XNS	☐	☐	☐	■	☐	☐
APPLETALK	☐	■	☐	■	☐	☐
OSI PROTOCOLS	1,2,4	1,2,3,4	1,2,3,4	1,4	1,2,3	4
ROUTING PROTOCOLS	1,3,4,5,6	1,3,4,5,6,7	1,2,3,4,5,6,7	1	1,2,3,4,5,6,7	1,3,6

LAN Bridging: **1.** = Learning Bridge **2.** = Spanning Tree **3.** = Source Routing **4.** = SRT Bridging
OSI Protocols: **1.** = 8073 **2.** = CLNS **3.** = CONS **4.** = X.25 PLP
Routing Protocols: **1.** = RIP **2.** = IGRP **3.** = OSPF **4.** = IS-IS **5.** = ES-IS **6.** = EGP **7.** = BGP
☐ = Yes ■ = No

the overhead placed on the VAX and the higher software cost.

Bull proposes either LAN Workplace for DOS (which gives TCP/IP and Telnet/FTP) or TES on the VAX. NetComm also proposes LAN Workplace for DOS and Spry Concurrent, but suggests that the VAX runs LAT (i.e. DECnet). Spry Concurrent is a DOS memory manager which gives simultaneous access to Novell NetWare servers (IPX/SPX) and Unix servers (TCP/IP).

Macintosh-to-VAX

Here the issue is whether to run either TCP/IP or IPX/SPX from the Macintosh to the VAX, or to use a DECnet gateway.

3Com's preferred solution is a third party LAT program, but it states that Telnet and FTP are used (TCP/IP). Bull suggests LAN Workplace for Macintosh and TCP/IP. U-B specifies both TCP/IP and NetWare for VMS on the VAX, and does not specify the PC software. Interlink suggests TES on the VAX. NetComm's solution is to run LAN Workplace for Macintosh and the Etherway router/gateway. Com Tech does not offer a solution.

Unix-to-VAX

The choice in connecting VMS and Unix processors is whether to add TCP/IP to the VAX or to have a TCP/IP-to-DECnet gateway. There is no solution for DECnet on Unix, apart from DEC's own DECnet Ultrix, which is a DECnet option on DEC's Unix workstations.

All vendors recommend TCP/IP as the solution, although Com Tech gets a higher rating for its description of the I/TCP package for the VAX which includes Telnet, FTP, SMTP, TFTP, Socket Library and SNMP. Bull goes down a point for also suggesting DECnet-Ultrix for the VAX. The VAX runs VMS and the only way to use DECnet Ultrix is if the Unix workstations are purchased from DEC.

PC-to-Unix

The most common solution from vendors for TCP/IP connectivity was to add TCP/IP to the client through Novell's LAN Workplace For DOS which includes most TCP/IP applications, such as Telnet for terminal emulation, FTP for file transfer, as well as remote Unix commands.

3Com suggests its own TCP product for PCs. Com Tech also suggests NetWare NFS for the NetWare server, which provides NetWare file server and print services for Unix workstation clients. U-B proposes the GARP gateway to convert IPX to TCP/IP but provided no information on how this solution is implemented.

Macintosh-to-Unix

3Com recommends the use of the public domain NCSA Telnet, which is supplied with its Ethernet adaptor for the Macintosh, the Etherlink NB. Ungermann-Bass proposes its MacUWS software package which, in conjunction with the MaxTalk module in the Access/One Hub, provides TCP/IP connectivity for Macintoshes. Each of the remaining four network vendors proposed Novell's LAN Workplace for Macintosh.

PC-to-IBM-C

There are a number of the issues to consider with regard to IBM-C mainframe access. Do you use both SNA and TCP/IP in the WAN? This complicates the WAN because SNA can't be routed as TCP/IP can, and it is difficult to mix, due to SNA's intolerance to long delays in the WAN. So do you put TCP/IP into the IBM-C in order to achieve a more manageable WAN? This would be impractical for large SNA networks due to the WAN performance advantages of SNA over TCP/IP. Do you use a 3745 front end processor, a 3172 LAN channel adaptor, or do you still use the VTAM/NCP with SDLC conversion or passthrough in the routers? Also consider whether the gateways/protocol converters give the PC client full em-

TABLE 4: PHYSICAL AND HARDWARE INTERFACE ISSUES

	3COM	BULL	COM TECH	INTERLINK	NETCOMM	U-B
DEVICE(S)	NetBuilder & LinkBuilder	NetBuilder & LinkBuilder	SynOptics LattisNet 3000 hubs	Netrix #1-ISS Wildcard ITX	Etherswitch, LAN^{2}LAN, Etherway, Netway	Access/One hub, Wellfleet router
MODULARITY	1,3	1,3	3	2,3	1,2,3	3
LAN INTERFACES	1,2,3,4,5,6	1,2,3,4,5,6	1,2,3,4,5,6	1,2,6	2,3,4	1,2,3,4,5
V.24	9.6k - 19.2k	38.4k	☐	600 - 19.2k	☐	19.2k
V.35	9.6k - 9.2M	7M	2M	64k	☐	2M
X.21	9.6k - 9.2M	7M	2M	64k	☐	2M
G.703	NetBuilder II	■	■	2M	N/S	☐
ISDN	1,2,3,4,5 via T/A	N/S	N/S	Future	N/S	1,2,3,4,5 via T/A
FASTPAC	N/S	N/S	■	1	N/S	1,2
DIAL-UP	Next Release	N/S	☐	N/S	N/S	☐
X.32	Next Release	N/S	■	N/S	N/S	Via T/A

LAN Interfaces: **1.** = 10Base-T **2.** = 802.3/AUI **3.** = 802.5/4M **4.** = 802.5/16M **5.** = FDDI (9314) **6.** = Frame Relay
ISDN: **1.** = BRI/SPC **2.** = PRI/SPC **3.** = BRI/Switched **4.** = PRI/Switched **5.** = X.25 B channel **6.** = X.25 D channel
Fastpac: **1.** = 802.3 **2.** = 802.5 **3.** = 2Mbps
Modularity: **1.** = Standalone **2.** = PC add-on **3.** = Chassis

☐ = Yes ■ = No N/S = Not Specified

TABLE 5: NETWORK MANAGEMENT

	3COM	BULL	COM TECH	INTERLINK	NETCOMM	U-B
NETWORK MANAGEMENT SYSTEM PLATFORM	SunNet Manager, ViewBuilder/Unix	SunNet Manager, ViewBuilder/Unix	LattisNet Manager	Netrix Network Manager	None Offered	NetDirector
HARDWARE	Sun Sparc	Sun Sparc	Sun Sparc	Apollo	N/S	PC
NMS PROTOCOLS	SNMP	SNMP	SNMP	SNMP	N/S	SNMP
NETMASTER/ NETVIEW	☐	■	☐	■	N/S	Access/View
FAULT MGT	1,2,3	1,2	1,2,4,5,6	1,2,3,4,5,6	N/S	1,2,3,4,5,6
PERFORMANCE MGT	1,2,3,4,5,7,8,9	1,2,3,4,5,7,9	1,2,4,5,6,7,8,9	1,2,3,4,5,6,7,8,9	N/S	1,2,3,4,5,6,7,8,9
SECURITY MGT	1,2,3	1,2,3	1,2,3	1,2,3	N/S	2,3
CONFIGURATION MGT	1,3	3	1,2,3	1,2,3	N/S	1,3
ACCOUNTING MGT	1,4,5	1,4	1,2,3,4,5	1,2,3,4,5	N/S	1,2,3,4
EXPERT SYSTEM	■	Expert Sniffer	1,2	1,2	N/S	1,2
USER INTERFACE	1,2,3,4	1,2,3,4	1,2,3,4	1,2,3,4	N/S	1,2,3,4

Fault Management: **1.** = Alarm Histories **2.** = Alarm Filter **3.** = Login History **4.** = Loopbacks **5.** = BERT **6.** = Test Packets/Frames
Performance Management: **1.** = Node Throughput **2.** = Link **3.** = bps **4.** = Frames **5.** = Packets **6.** = Delays **7.** = CRC **8.** = Lost Data, **9.**= Active Links
Security Management: **1.** = User Restrictions On Links **2.** = User Restrictions On Nodes **3.** = Admin Password
Configuration Management: **1.** = Validity Checker **2.** = Bandwidth Splitting **3.** = Realtime Reconfiguration
Accounting Management: **1.** = Usage Per Link **2.** = Per User **3.** = Per User Group **4.** = Service Level Reporting **5.** = Uptime Reporting
Expert System Features: **1.** = Diagnosis **2.** = Corrective Procedures
User Interface: **1.** = Windows **2.** = Icons **3.** = Mouse **4.** = Colour

☐= Yes ■= No N/S = Not Specified

ulation of a 3270-type terminal with all attributes, multiple sessions and hot key to other environments, and the ease of transferring files to/from the mainframe.

3Com was the only shortlisted vendor to propose the IBM 3172 rather that the traditional 3745. 3Com proposed TCP/IP rather than SNA on the IBM mainframe to eliminate the need for SDLC links and cluster controllers. This radical solution allows for migration away from SNA to a TCP/IP-based WAN. If SNA is still required, 3Com can support poll spoofing with either SDLC/LLC2 conversion and bridging, or IP encapsulation and routing. PC access is established through TN3270 (3270 encapsulated within Telnet) and a corresponding TN3270 gateway within the IBM-C.

NetComm proposed the Windows-based WIN3270 on the PC and the Netway 2000, a standalone SNA gateway, which supports AppleTalk and IPX/SPX. This would require a gateway at each of the 10 locations and a separate WAN link for each SDLC link back to the mainframe in Sydney. This effectively means a separate WAN just for SNA which seems messy.

Bull, Com Tech and U-B propose Novell's 3270 LAN Workstation software on the PC. This works with an appropriate SNA gateway such as NetWare SNA Gateway or NetWare for SAA. The advantage with this option is that it allows the mainframe to run native SNA, but the disadvantage is the gateway bottleneck. Both Com Tech and U-B chose NetWare for SAA and Bull chose its own DPX-20 processor which includes an OEM version of Novell's gateway software. U-B points out that the Networth Application Engine with NetWare 3.11 Runtime can be used if demand for IBM-C connectivity is high, otherwise the NetWare for SAA NLM running on NetWare servers would be adequate. Interlink uses its Wildcard product which is a range of PC card upgrades providing NetBIOS, IPX/SPX and TCP/IP access to SNA mainframes, although implementation details were not given.

It is significant that Com Tech and NetComm propose one gateway at each location in addition to the file servers, whereas other vendors only stipulate gateways at the host. This is an important performance issue.

Macintosh-to-IBM-C

3Com's solution for the Macintosh was similar to its PC solution, that is, TCP/IP access across the WAN up to the mainframe equipped with TCP/IP software. Bull proposed LAN Workplace for Macintosh with the DPX-20 TCP/IP to SNA gateway. The limitation with this is that it gives Telnet emulation rather than 3278. Interlink's Wildcard Open software option provides Macintosh clients using LAN Workplace for Macintosh (TCP/IP) with 3270 access to the mainframe, although again there is a lack of detailed description.

Com Tech were alone in suggesting the 'all Novell' solution of 3270 LAN Workstation for Macintosh with NetWare for SAA, which provides the richest feature set (e.g. LU6.2).

NetComm suggested the Netway Mac Advanced 3270 software working with the Netway 2000 gateway, which gives creditable 3270 emulation features. U-B also uses the Netway gateway, but it is not clear how this fits into its Access/One solution.

Unix-to-IBM-C

The solutions for 3Com, Bull, and Interlink are similar to their PC-mainframe and Macintosh-mainframe solutions, which use TCP/IP across the WAN. U-B also suggests the that TCP/IP should be used on the mainframe. Com Tech and NetComm do not offer a solution.

WAN Issues

It is clear from this limited sample of data connectivity vendors that the LAN culture and the WAN culture are still yet to converge. Until the LAN vendors and the WAN vendors appreciate the big picture, they'll continue to supply products which are generally stronger in one area or another. For example, LAN vendors provide good performance locally with multiprotocol features, and WAN vendors appreciate the performance and cost trade-offs of wide area networks made up of expensive and sometimes unreliable carrier links. The industry still has some scope for improvement in the area of connecting high speed LANs over a wide area, using frame relay, switched ISDN (for backup/overflow) or new MAN services like Telecom's Fastpac.

Another issue to watch is the amount of LAN traffic which unnecessarily goes over the WAN. An example of this is the packet broadcasting of NetBIOS and source route bridging (i.e. Token Ring) LANs. Some of the better routers rationalise this broadcasting, thereby reducing WAN congestion.

Hardware Issues

In terms of integrating LAN and WAN hardware, four vendors are clearly in front, with

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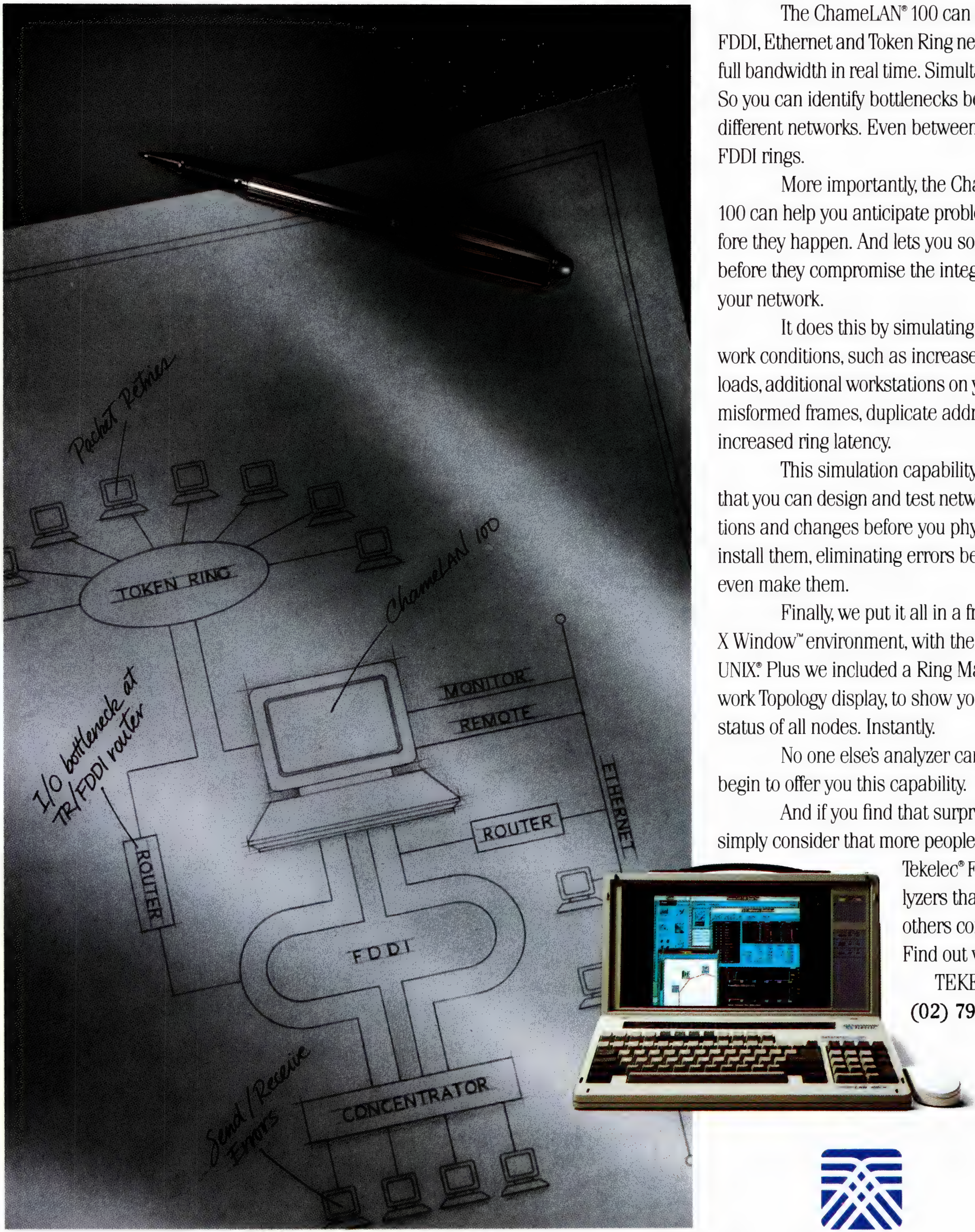

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TABLE 6: EVALUATION SUMMARY

	3COM	BULL	COM TECH	INTERLINK	NETCOMM	U-B
MAC - NETWARE	****	****	****	***	****	****
UNIX - NETWARE	**	****	****	****	****	****
DOS PC - VAX	****	*****	***	***	**	***
MAC - VAX	**	****	*	***	****	**
UNIX - VAX	***	**	****	***	***	***
DOS PC - UNIX	****	****	*****	****	****	**
MAC - UNIX	****	****	****	****	****	****
DOS PC - IBM-C	*****	****	****	***	***	***
MAC - IBM-C	****	***	*****	***	****	***
UNIX - IBM-C	****	****	*	***	*	***
WAN FEATURES	***	***	***	****	**	***
HARDWARE FEATURES	****	****	*****	***	***	*****
RELIABILITY & PERFORMANCE	****	****	*****	***	***	****
N/W MANAGEMENT	****	****	*****	**	*	****

* Poor   ** Some Deficiency   *** Fair   **** Good   ***** Excellent

Com Tech and U-B able to integrate nearly everything into the intelligent hub.

With the strong trend towards intelligent hubs being the basic building block for enterprise wide area networks, these two get the highest ratings. 3Com and Bull have the LinkBuilder hubs separate from their NetBuilder LAN/WAN devices, although they are designed to compliment each other.

Both Interlink and NetComm utilise separate boxes for most of the RFI functions, which increases complexity and reduces performance (due to interfacing bottlenecks). All hardware interfaces from the six short-listed vendors have a wide range of speeds and interface types.

Reliability and Performance

All except NetComm and U-B proposed triangulation between the three major sites to provide higher reliability, with backup provided by alternate dedicated paths, Telecom's Austpac service or dial-up links. Bit errors would be handled through higher layer re-transmissions (SDLC, TCP and SPX).

Some products had redundant hardware built in, or at least an option for this. For example, Com Tech built high reliability into its design, using a combination of multiple segments, backup power supplies, modular (distributed) hubs and backup WAN links.

Performance bottlenecks were predictably in the WAN links, with utilisation typically in the 20% to 70% range for peak load. On the other hand, the better performing dedicated routers, switches and hubs rarely exceeded 10% of their capacity (e.g. SynOptics 3000, Kalpana Etherswitch, LinkBuilder 3GH, and Netrix #1-ISS). In a large network though, it would be wise to verify performance for the PC add-on solutions.

Network Management

3Com, Bull and Com Tech offer an OEM version of Sun's SunNet Manager, with their own options added. SunNet Manager is virtually a de facto standard for the management of SNMP networks.

Both 3Com and Bull offer SunNet Manager in the form of ViewBuilder/Unix which is tailored to control NetBuilders and LinkBuilder hubs. They also offer RBCS, which is a set of tools that simplifies management of a large number of 3Com brouters, and LinkWatch which is a software option which can extend SNMP to personal computers equipped with 3Com adaptors. The Novell LANlord product is also offered to give access to workstation files and configuration information.

Bull also offers Network General's Expert Sniffer and Distributed Sniffer products. The Expert Sniffer is a 7-layer tool which both diagnoses and resolves problems. The Distributed Sniffer provides remote analysis of alarms, SNMP traps and protocol analysis.

In its solution, Com Tech offered LattisNet Manager, which is the SynOptics flavour of SunNet Manager and is arguably the most comprehensive version.

Interlink's management system uses a graphics workstation, but does not seem to be able to manage a network of different SNMP devices. Further, the Wildcard gateway range does not support open management protocols (e.g. SNMP, CMIP).

NetComm does not offer a network management system, but all of the company's products have proprietary configuration facilities, typically accessed via a PC menu. Ungermann-Bass offers NetDirector, which is a PC-based, SNMP network management platform and compares well with SunNet Manager with respect to network management functions.

Rating the Responses

Both Interlink and NetComm have good products worth considering. Interlink's #1-ISS is an extremely good switch/multiplexer for large and complex networks and the Wildcard modules can easily convert an ordinary PC into a gateway. NetComm has a wide range of WAN and LAN products which suit many requirements, including the very high performance Etherswitch and the LAN^{2}LAN router.

Ungermann-Bass very clearly possesses a strong product range which probably has the best balance between LAN and WAN of all the vendors examined, although its RFI response did not quite do full justice to the company's excellent products.

3Com get third place in this review, due largely to the rich feature set of its LinkBuilder hubs and NetBuilder brouters.

Bull and Com Tech share equal first place for different reasons. Bull's strength was in its better understanding of fitting the 3Com product range into the wide area picture. Bull demonstrated a better knowledge of integrating the solution and improved on the 3Com solution with additional products (e.g. DPX-20 and Sniffer) and had a better wide area network design. Com Tech's strength was in its local area network design, and the SynOptics product range.

Brian White is a Senior Consultant at AAS Pty Ltd in Sydney, where he specialises in strategic planning, benchmarking, financial analysis and the applications of communications technologies.

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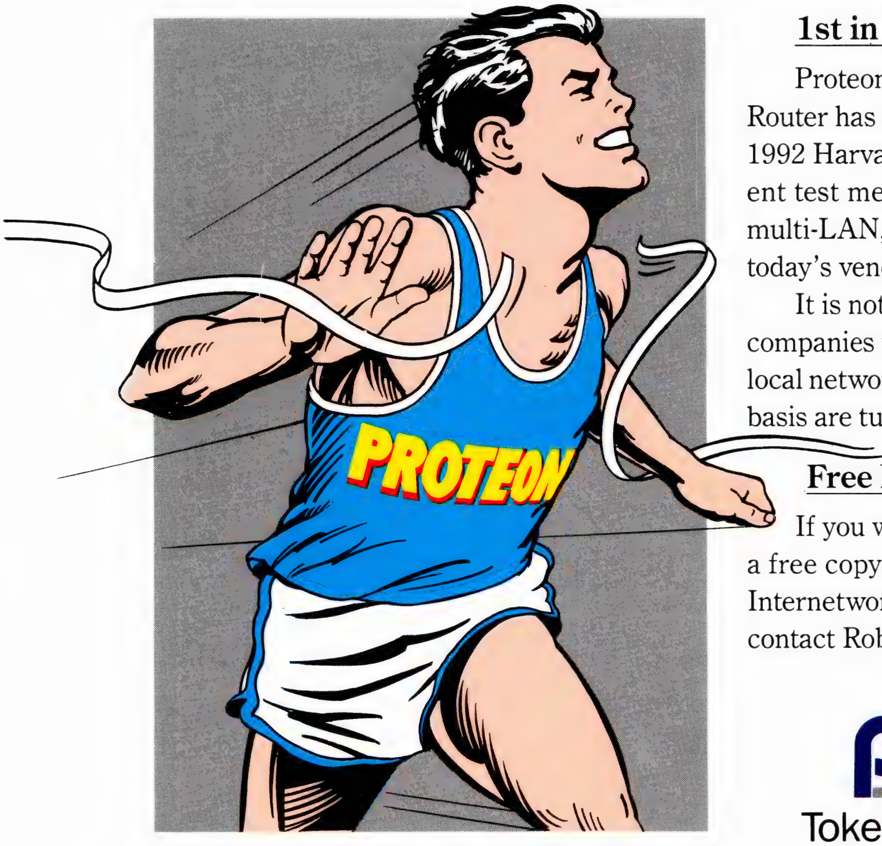

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NetWare 4.0: A Directory to the Enterprise

Novell is counting on a new directory service to turn a NetWare weakness into a clear advantage. And its new Burst Mode boosts performance over WAN links without sacrificing its LAN advantages.

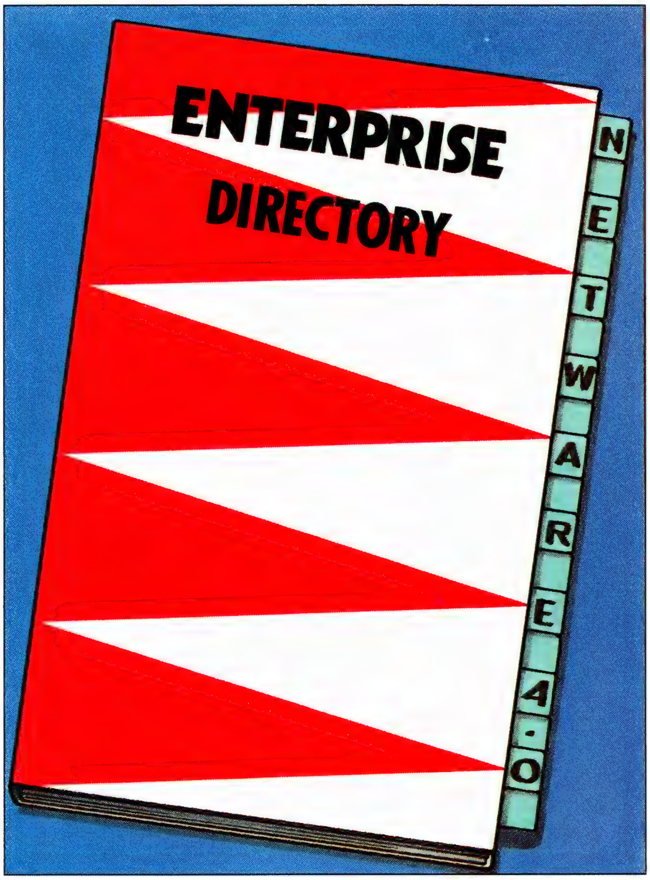
Novell's journey to enterprise networking, which began in 1989 with NetWare Version 3.0, is now in full gear. The vendor began picking up the pace last year with the release of products like Burst Mode and LANRES (see related stories in this special report). By March, Novell should hit top speed with the arrival of NetWare Version 4.0, its next-generation LAN operating system. NetWare 4.0 is much more than a typical product upgrade. To be sure, Novell promises that its new NetWare version will include the usual collection of upgrade benefits, such as better performance and improved ease of use. But the key to NetWare 4.0 is that it addresses what has been one of NetWare's most nagging weaknesses — its inability to let LAN administrators manage large networks easily.

Novell is counting on its new NetWare Directory Service (NDS) to transform NetWare's biggest deficiency into its strongest competitive advantage. NDS is by far the most visible and significant addition in NetWare 4.0. The new NetWare is not yet available — Novell was scheduled to ship the operating system by the end of last year — but early documentation and technical information from the vendor indicate that NDS will be everything that Novell is cracking it up to be.

NDS consists of a group of services and functions that provide a cohesive methodology for the administration and management of multiserver, multilocation networks. The heart of NDS is a distributed database that automatically makes changes available to designated NetWare servers located throughout a network. NDS offers a number of ways for users and applications to access the information stored in the directory. For instance, a yellow-paging feature helps users find a specific type of network resource, such as Postscript printers. NDS marks a radical departure from the management methodology used in NetWare 2.X and 3.X. In essence, NDS embodies Novell's long-awaited response to the Streettalk directory service from Banyan Systems. For years, Streettalk had helped Banyan's Vines operating system remain a formidable competitor to NetWare, especially for large LAN installations (see 'NDS: Novell's Answer to Streettalk on page 85').

By developing NDS, Novell in effect has conceded that its existing directory method, the NetWare bindery, does not provide for optimal management of enterprise networks. The bindery is a flat-file database used in NetWare 2.X and 3.X to control the administration of security and access rights for users or groups of users.

For LANs comprising a single server, the bindery does an adequate management job, although it does have some limitations even in small networks. For example, some network objects, such as printers, are not represented in the bindery at all. The bindery offers no central means for managing NetWare servers. The bindery maintained at each server is separate from all other servers and binderies on the network. A user who has access rights to 15 servers on a network is managed as 15 separate objects on 15 separate binderies.



To simplify network administration, Novell introduced the NetWare Name Service (NNS) in 1991. NNS includes a new bindery object, called the domain, as well as a new set of administrative applications for use with the bindery. The NNS domain is a group

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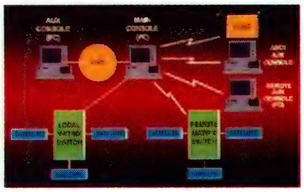

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DDN
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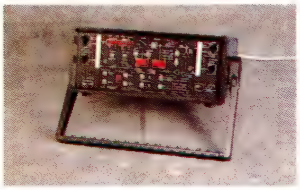

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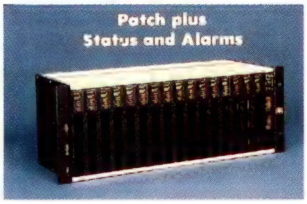

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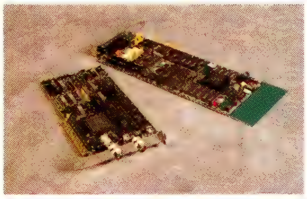

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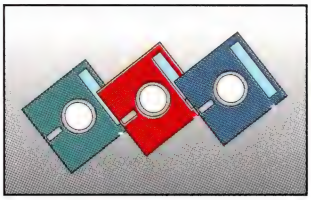

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NDS: Novell's Answer to Streettalk

NetWare Directory Service (NDS) is the most important component in Novell's forthcoming NetWare 4.0, and is Novell's answer to a product feature introduced in 1983 by Banyan Systems for its Vines operating system. That feature, the Streettalk directory service, has been credited with giving Banyan's Vines a big advantage over NetWare when it comes to handling large networks. If Novell delivers all the features it now claims for NDS, it not only will erase Banyan's edge but also will swing the race in Novell's favour.

A comparison of NDS and Streettalk features reveals a great number of similarities (see table). But there are three areas in which the two offerings differ significantly: The way directory information is distributed and replicated; the way security is implemented; and the types of objects that can be stored in directories. If preliminary documentation about NDS is accurate, then Novell's offerings is superior to Streettalk on all three counts.

In terms of distribution and replication, NDS allows any directory information, from user profiles to security information, to be replicated on any NetWare 4.0 server. Streettalk, in contrast, only replicates user names for local access. The database of local names then refers users to centralised Streettalk directory servers, where attributes associated with the names are stored. Novell's approach gives administrators more leeway in designing networks. Directory servers can be placed at any location for faster local access.

The rationale behind Streettalk's design is that security is enhanced by limiting where information can be placed. Like Streettalk, NDS provides a multilevel security system, meaning that different levels of access rights can be assigned for different objects. Novell developed its security system with the help of RSA Data Security, a leading vendor of public/private key-based security packages. Although Banyan says it intends to migrate its proprietary security system to the RSA de facto standard, until it does so Novell will have an important advantage. NDS supports a wider variety of object types than Streettalk. Developers also can add new objects through application program interfaces (APIs). Banyan says the six object types supported by Streettalk are flexible enough to let developers and users create and store whatever information they need.

Ben Ruiz and John Herron

NetWare Directory Services vs Banyan Streettalk

	NetWare Directory Services	**Banyan Streettalk**
Development Environment	Client-Server, C language	Client-Server, C language
Data Location	Distributed and replicated	Distributed database with read-only lookup for Streettalk Directory Assistance
Network Operating Systems	NetWare 4.0, Native NetWare for OS/2, NetWare for Unix (20+ OEM versions)	All Vines versions, SCO Unix, NetWare
Client Operating Systems	DOS, Windows, OS/2, Macintosh, Unix	DOS, Windows, OS/2, Macintosh
System Memory Requirements	DOS client — 60 kbytes (can be reduced using memory management); Server — 8 Mbytes	DOS client — 122 kbytes (can be reduced using memory management); Server — 8 Mbytes
Security	Authentication via RSA public key-based multilevel network-wide access control	Authentication via proprietary token-based Vines security services
Default Object Types	Alias, bindery object, computer, country, directory map, group, locality, NCP server, organisation, organisational role, organisational unit, print server, printer, profile, queue, Storage Management Services, top, transaction set, unknown user, volume	Users, nicknames, lists, services, servers, groups
Naming Levels	Unlimited Levels	Three levels
Standards	Based on X.500; initial X.500 compatibility via gateway; committed to full X.500 implementation	X.500-like; committed to full X.500 interoperability

of servers that can be administered as one virtual server. NNS synchronises all server binderies in a single domain simply by copying all objects from one bindery to another. For example, to add a user to a domain, a LAN administrator uses Novell's NETCON utility to add the user to a single bindery. The utility then automatically copies the user object to all other servers in the domain.

Although NNS meets the primary objective of easing the administration of multiserver networks, the mechanics behind NNS fail in several respects. Because all binderies contain all objects in a multiserver domain, they typically grow extremely large, slowing the synchronisation process to the point at which it can take hours to synchronise all binderies in a domain. The large bindery files also take up valuable storage space.

Other problems occur because NNS performs synchronisation from a client workstation, and it does not validate the source bindery prior to copying. This means there is no way to guarantee that the bindery being used to update all other binderies contains valid data. If a workstation is interrupted while performing the synchronisation process, there is no mechanism to indicate failure to the destination server. The result might be a partially updated or even non-functional bindery within the domain. This flawed bindery can then be spread to other domain members.

The bindery is extensible, which means that third-party application developers can add new object definitions to the bindery. Extensibility has become a popular option for many NetWare utility products and is crucial in an enterprise environment. But object definitions added to binderies cannot be recognised or replicated by the NNS synchronisation process. As a result, information about these third-party objects can be lost easily.

The bindery's flat-file structure is poorly suited to representing the relationships between objects. The two-dimensional database structure means that the bindery can represent only a limited perception of objects and their relationships. For instance, it can indicate that a given user is a member of a group, but it can't show that the group is part of a larger department, organisation, or company. The result is a limited and distorted view of the network's organisation. When

Continued on page 89

Burst Mode Boosts NetWare's Wide-Area Acumen

For years, NetWare has served as vivid proof that every silver lining has a cloud. The technology that earned NetWare a solid reputation as a fast and efficient operating system for LAN workgroups also saddled Novell's signature product with a reputation for being a plodder in the wide area.

Novell is counting heavily on its new Burst Mode technology to chase its WAN clouds away. According to Novell, Burst Mode software boosts NetWare's WAN performance without sacrificing any of the local area speed that has made NetWare the world's leading PC LAN operating system.

The proof, of course, is in the testing. First-ever tests of Burst Mode by the *Data Communications* Test Lab show that the technology does in fact mitigate several performance problems that can crop up when NetWare servers are accessed over wide area networks. By tweaking some of NetWare's native protocols, Burst Mode can improve NetWare's WAN performance, in some cases to a significant degree. The improvements are not across the board; Burst Mode can actually have a negative effect on efficiency for some types of transactions. The good news, however, is that Burst Mode's effectiveness generally grows along with the complexity and speed of a network and the size of the data records to be transferred — in other words, it worked best with the kinds of enterprise networks that users envision.

Burst Mode should enable Novell to give users the wide area efficiency they need without compromising the superior local area performance that has made NetWare the indisputable king of LAN operating systems. In designing Burst Mode, Novell was careful not to forsake existing NetWare installations; NetWare servers equipped with Burst Mode can communicate with older servers, albeit without taking advantage of the technology's wide area network efficiencies.

In the past, NetWare's WAN shortcomings were not much of an issue; users were more interested in taking advantage of NetWare's superior performance in the local area. Now that organisations are looking to build enterprise-wide networks and applications, the operating system's wide area inefficiencies have become much more noticeable.

In the conventional NetWare protocol stack, application-level requests, such as Open File, Write Data, or Logout requests, and their responses are carried in the NetWare Core Protocol (see Figure A). To speed the process of getting NCP data from the workstation to the server and back, Novell encapsulates NCP in its Internet Packet Exchange (IPX) protocol. IPX is a 'best shot' datagram service — such protocols are extremely fast, but they offer no guarantee that packets will be delivered or that the packets will arrive at their destination in the same order they were sent.

To cope with potential errors in data due to faulty network conditions while still keeping NetWare Shell — Novell's workstation software — as simple and fast as possible, Novell built NCP to do its own error checking. NCP also allows only one outstanding request between a workstation and a server at any given time; each request must be fulfilled before NetWare Shell can send the next request. In a pure LAN environment, this approach is acceptable. Because LANs are inherently reliable, Novell could have NCP handle the few errors that do occur, rather than add a separate error-checking layer. The single-request limitation is not critical because with the low delay characteristic of LANs, acknowledgments come back very quickly.

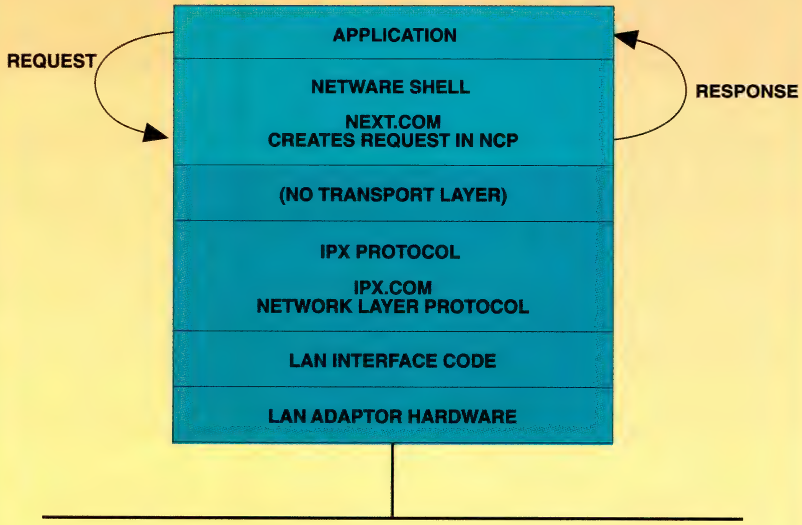
Wide area networks, because they are relatively slow and more prone to errors, are not well-suited to this approach. In WANs, delays of one second are common; with such delays, NCP's idle time as it waits for acknowledgment after acknowledgment can grow to alarming proportions. Because the incidence of errors is greater in a WAN, trapping errors early on in a low-level protocol layer is most efficient.

A typical client-server transaction illustrates the problems that can occur when NetWare's conventional LAN scheme is used over the wide area. In the transaction, a NetWare client writes a 32 kbyte record to a NetWare server. NetWare Shell knows the maximum permitted packet size on the LAN and accordingly splits the record into fragments. (NetWare's default is 1,024 bytes on Ethernet, although the packet size can be set as high as 1,500 bytes). After sending each fragment, the workstation has to wait for the full, round-trip delay of the intervening WAN for the acknowledgment from the server before it can send the next fragment. That delay can be anywhere from a few tenths of a second to a second or more. Under this scenario, it doesn't take long for accumulated delay to grow to unacceptable proportions.

To maintain performance in this sort of environment, WAN protocols like TCP/IP use windowing techniques, which allow for the sending of many packets at once, requiring only one response to acknowledge the arrival of a group of packets (see 'A Better Sliding Window Protocol' on page 87). Windowing makes far more efficient use of available bandwidth and drastically cuts the time it takes to transmit large blocks of data over a WAN link. In fact, Novell has offered just such a protocol for some time. The Sequenced Packet Exchange (SPX) transport protocol offers guaranteed delivery and windowed transmissions. SPX sits on top of IPX in the NetWare protocol stack and is

Figure A: NetWare's Workstation Protocol Stack

In the conventional NetWare protocol stack, NetWare Core Protocol (NCP) requests are encapsulated in Internet Packet Exchange (IPX), a 'best shot' datagram service that works well in NetWare LAN environments but has some reliability and performance problems in the wide area.



included in Novell's server and workstation software along with IPX. Novell has written its remote console program to use SPX; various third-party programs, such as mainframe gateways and tape backup systems, also use SPX.

The problem with SPX is that it achieves its WAN efficiencies at the expense of some of NetWare's LAN speed. SPX incurs a small amount of extra overhead that reduces performance for all applications except those that involve transmitting large chunks of data over complex WANs. For this reason, NetWare Shell is written to bypass SPX for the sake of speed.

Inside Burst Mode

To maintain its performance in the local environment, while at the same time improving NetWare's operating efficiency over WANs, Novell needed a 'bolt-on' protocol that would boost WAN performance without adversely affecting normal LAN traffic. Enter Burst Mode.

Burst Mode technology ships as two components: A new version of NetWare Shell, loaded as BNETX.COM, and a NetWare Loadable Module (NLM) that runs on the server. The BNETX shell takes up about 6 to 8 kbytes more workstation RAM than the previous NetWare Shell code.

Although both workstation and server components must be present to take advantage of Burst Mode, the BNETX shell can communicate with non-Burst Mode servers, and servers with the Burst Mode NLM can communicate with non-Burst Mode workstations. A workstation could have links to two servers, with one session running Burst Mode and the other not. Burst Mode technology has been referred to as Burst Mode IPX, but that's a misnomer because Burst Mode actually uses the standard IPX protocol. In fact, because Burst Mode uses an unadulterated version of IPX, existing IPX routers can handle Burst Mode traffic without any software changes.

Burst Mode's chance to improve communications between a workstation and a server begins when a workstation application reads from or writes to files by issuing a function call to DOS. NetWare Shell intercepts the request and checks to see if it involves a network drive. If it does, the shell passes the request to the appropriate file server. If a request is larger than a single LAN frame, NetWare Shell fragments the request into multiple frames. Without Burst Mode, the shell must receive an acknowledgment from the server for each frame before it sends the next frame. The job of BNETX is to recognise these oversized requests (which might involve several hundred kilobytes of data) and to send the resulting fragments in bursts, one fragment after another, without waiting for individual acknowledgments. On the server side, the NLM performs the same function for oversized responses.

Several key factors determine how effective Burst Mode is in handling network traffic: The frame size and the amount of data involved in a transaction; the network's end-to-end delay; the number of hops in the network; and the network's window capacity, or the number of packets that the network allows a node to send without requiring an acknowledgment. This latter factor pertains to X.25 networks only. The speed of the link also influences Burst Mode's effectiveness. Many application requests, including small reads and writes, fit into a single frame. Burst Mode offers no improvement for these exchanges; in fact, the lab tests indicate that Burst Mode can have a slightly negative effect on throughput for certain single-packet communications. Burst Mode only benefits requests that involve records larger than NetWare's maximum allowable frame size, which is 1,500 bytes for Ethernet, 4,096 bytes for 4Mbps Token Ring, and 16 kbytes for 16Mbps Token Ring.

Some NetWare routers intercept requests by workstations to use large packet sizes, modifying the requests to force the IPX packet size down to 512 bytes. This is because IPX actually is based on the Xerox Network Services (XNS) protocol, which allows a maximum packet size of 512 bytes.

In connections with low round-trip delays, such as clear-channel high speed links, NCP's single-request limit is not a big handicap. But the higher the delay, the more valuable Burst Mode becomes. Burst Mode is most adept at improving throughput in networks that have several intermediate nodes between the workstation and server. Each of these nodes, or hoops, has a set of packet buffers that Burst Mode can fill. The larger number of buffers means Burst Mode can keep a larger number of packets in transit at any given time.

The WAN's window capacity also has a significant effect on Burst Mode's performance. Window capacity refers to the number of data packets the WAN allows a transmitting node to place on the network before it tells the node to wait. Frame relay and leased-line networks do not place such tight restrictions on packet transmission, but X.25 networks do have specific window capacities. There's no point in having a workstation throw streams of packets into a network if the network itself throttles them. If Burst Mode pours a dozen packets into a router that in turn is feeding the packets into an X.25 pipe with a window capacity of two, those extra frames will simply get buffered by the router, and most of Burst Mode's advantage is lost. As the WAN's window capacity goes up, the benefits from Burst Mode increase.

To get a full reading on Burst Mode's performance, the Lab put the technology to work in three different wide area network environments: With clear-channel links, including circuits ranging from 9.6Kbps to 256Kbps; in X.25 networks; and in frame relay networks. X.25 networks operating at 9.6Kbps were tested even though most users would prefer not to employ such slow links — many WAN users, especially those with international links, have no alternative available to them.

A Better Sliding Window Protocol

Novell calls Burst Mode a modified sliding window protocol. Actually, the differences between Burst Mode and conventional sliding window protocols are significant and have important implications for those who operate WANs.

A conventional sliding window protocol sends up to N+X packets (where X is the window size) before seeing an acknowledgment for packet N+1 from the receiving station. Big window sizes are considered better than smaller sizes, because in a reliable network — and today's digital services are pretty reliable — errors do not occur often.

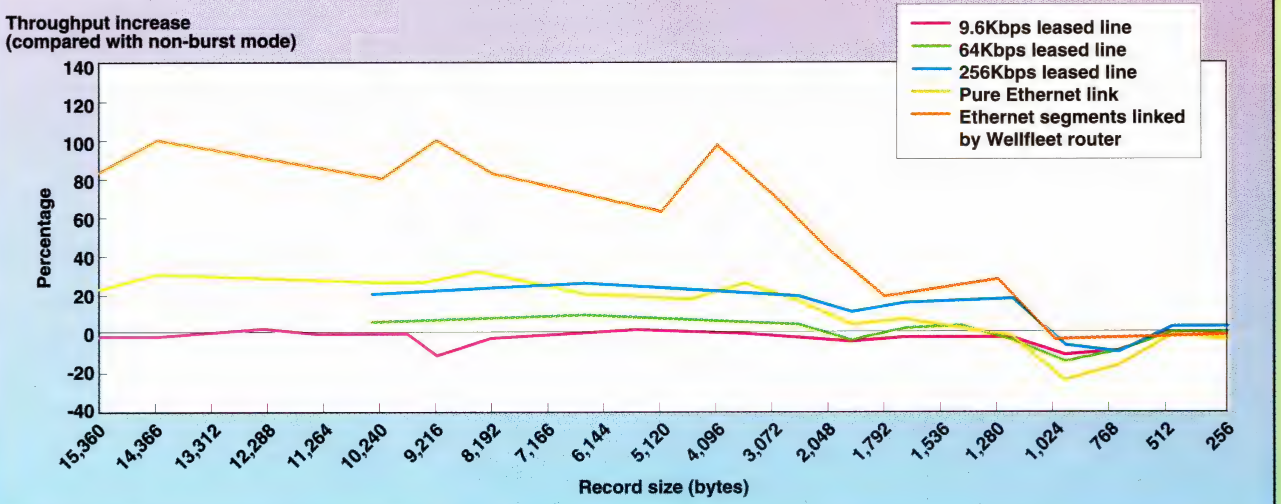
The problem with large window sizes is that when an error does occur, recovery is more time-consuming. If packet number 12 in a stream of 96 packets is damaged, and the remainder of the packets have been sent before the error is noticed, every packet from 12 through 96 must be resent. Unlike sliding window protocols, which operate at the transport level or below, Burst Mode operates at the application level, which means it has knowledge of the transaction's contents.

Because of this, a Burst Mode station resends only the one damaged packet. The resent packet is then inserted into the burst, and the completed record is handed up to the application layer. This ability improves performance for the end-user. If a Burst Mode server or workstation finds itself having to resend an unusually high number of packets, it will assume that the WAN link is congested and will dynamically reduce the number of packets sent in a burst until conditions improve. This is another advantage over conventional protocols, which run at a fixed window size regardless of line conditions.

Burst Mode (Cont.)

Figure B: Burst Mode Performance, Leased Lines

Results of Burst Mode tests on leased lines show that, in general, the faster the link, the more benefit Burst Mode provides. Performance boosts are most pronounced for Ethernet segments attached by Wellfleet routers.



The Test Bed

The test bed comprised two Ethernet segments, one containing a NetWare 3.11 server and the other a workstation. The server and the workstation used in the test were AST Research 33MHz 386 PCs fitted with 16-bit Industry Standard Architecture (ISA) Ethernet adaptors. The Ethernet segments were connected to the WAN by a Link Node router, a midrange product from Wellfleet Communications (represented in Australia by JN Almgren).

To keep variables like traffic and interference from other users from affecting the results, the tests were conducted on a private network which was built expressly for testing rather than a public network. The private network is owned and operated by US-based Telematics International, a maker of packet switches. The Telematics network linked the Wellfleet routers via an X.25 or frame relay service at speeds from 9.6Kbps to 2Mbps. The simulated wide area network included three Telematics packet switches in series. In addition, clear-channel connections were simulated by connecting the routers back-to-back.

Most of the tests performed don't use applications to generate and measure data; they perform these functions at a lower level. Unfortunately, there is no way to feed data to Burst Mode other than through an application. Burst Mode resides in NetWare Shell; using a low-level IPX interface would bypass Burst Mode. The application used to generate data was Novell's Perform, a utility that generates a stream of read requests in varying sizes. The utility spends a preset amount of time repeating a certain type of request before it logs throughput to a file and moves on to the next read size.

In the test, Perform was set to generate a sequence of read operations that caused the exchange of records ranging in size from 256 bytes to 15 kbytes. The 256 byte minimum was well below the maximum packet size allowed by the Ethernets used in the test, which meant they were too low for Burst Mode to have a positive effect on throughput.

The 15 kbyte maximum was 15 times the 1 kbyte maximum packet size used in the test network; it also represented more data than a single burst would convey in the network. Burst Mode's 'Buffers' parameter, which is configurable on the workstation, is one variable that determines how many frames can be sent in a stream before a response is required from the receiving server. For the tests, this parameter was left at the default setting of eight. This setting was chosen as a reasonable compromise between the lower limit, which is two frames, and the upper limit, 10 frames. Novell warns that setting the parameter too high can reduce performance in some cases.

To provide a reference benchmark, performance was measured with and without Burst Mode for each configuration tested. Tests also were conducted with the two Ethernet segments connected to the same router, and with the workstation and server attached to the same Ethernet segment — again, both with and without Burst Mode.

Gauging the Results

The test results show throughput gains for various record sizes when Burst Mode was used compared with when it was not used (see Figure B). Results of the leased-line tests clearly indicate that the faster and more complex a network is, the more benefits Burst Mode offers. Burst Mode provided no performance boost when used over a 9.6Kbps leased line — in fact, Burst Mode throughput over 9.6Kbps lines was less than that for non-Burst Mode transmissions for many record sizes. Throughput improved marginally for 64Kbps circuits, but it went up significantly for 256Kbps lines, increasing by 25% for some record sizes. These results suggest that users of E1 (2.048Mbps) leased lines should benefit even more from Burst Mode.

The effects of network complexity on Burst Mode's performance are illustrated by comparing the performance of a single Ethernet segment with that of two Ethernet segments joined by a Link Node router. With the single segment, Burst Mode increased throughput by a maximum of 30% for large records. With the two segments linked by a Wellfleet router, performance improved by nearly 100%, mainly because of the extra buffering introduced by the router.

Packet size and window capacity parameters figured significantly in the X.25 tests (only X.25 networks place limits on the settings of these parameters). In the tests, Burst Mode proved to have a relatively minor effect on throughput for 64Kbps X.25 networks with small packet sizes (128 bytes) and low window capacity (two). With a larger packet size (512 bytes) and a higher window capacity (seven), performance was boosted by as much as 140%.

The tests also revealed some degree of quirkiness in Burst Mode's ability to handle different packet sizes. On an Ethernet network segment, Burst Mode had no effect on throughput when the smallest data records — 256 and 512 bytes — were transmitted. This was expected, since data records that size fit into a single LAN frame. But throughput for slightly larger records — those of 768 and 1,024 bytes — actually was adversely affected by Burst Mode.

It turns out that Burst Mode itself fragments records greater than 512 bytes. Novell's reasons for fragmenting records at this smaller size are not clear; the result, however, is that with records greater than 512 bytes but less than the maximum LAN frame size, performance with Burst Mode is diminished.

For records above the local area network frame limit, however, Burst Mode almost always offers better throughput. In the tests, the level of improvement generally peaked for records of 12 to 13-kbytes; this was the upper limit for data that could be sent in a single burst, given the settings in the Buffers parameter. On clear-channel lines, performance gains leveled off for record sizes of 7,000 bytes; for this reason, Burst Mode was not tested with record sizes greater than 11,000 bytes on clear-channel lines.

The tests also showed that frame relay doesn't necessarily offer significant performance benefits compared with X.25 links of like speed. Logic holds that Burst Mode should offer significantly better performance for frame relay networks than for X.25 networks, since frame relay has no window limitation and supports large frames by default. Frame relay switches also are supposed to be able to start forwarding large frames before completely receiving them, which should reduce serialisation delays — the time taken to clock a frame into a switch or network node before processing can start.

In the tests Burst Mode produced relatively minor benefits for 64Kbps frame relay compared with 64Kbps X.25. Part of this is due to the fact that Telematics didn't have its latest, true frame relay switch installed in the test network. Eventually, however, frame relay should enable Burst Mode to achieve greater performance improvements. Overall, Burst Mode is an invaluable NetWare tool for wide area network communications. It doesn't cure all of NetWare's WAN problems, but it does at least offer relief to both network designers and end-users.

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From page 85

Novell introduced NNS in 1991, it already had NDS on the drawing board. End-users and third-party developers, who knew of Novell's plan for a new directory service, urged Novell to produce an interim product. NNS was released as a stop-gap measure; to shorten development time. Novell used its bindery technology to create NNS.

Inside NDS

Many of the shortcomings of the NetWare bindery and NNS are addressed in NDS. To accommodate enterprise networks, Novell decided to put aside the work it invested in the bindery. The vendor derived NDS from the services described in the CCITT's X.500 directory recommendations. With NDS, Novell is replacing the NetWare bindery with a new internal component: The Directory Information Base (DIB). The DIB is a hierarchical database of network objects. Objects can be people, organisations, computers, or services — all the logical or physical items in the network. Objects have associated attributes, which, in turn, have assigned values.

The most important attribute of an object is its name. The name associated with an object fits within the user's perception of the network; it can be read and remembered easily by users. For example, the value of a name attribute of a user object may be 'SamW.' The name is intended to be convenient for users; other attributes, such as the network address, are intended for use by computers.

To show relationships between objects, names are arranged in hierarchical fashion within the DIB to form a Directory Information Tree (see figure on page 94). NDS specifies a syntax (or naming convention) to use when referring to objects; this syntax indicates an object's position within the hierarchy. The uppermost tier in the tree is country (C), followed by organisation (O), organisational unit (OU), locality (L), and common name (CN). The common name is the lowest level in the hierarchy and usually is associated with end-users or end-node devices, such as PCs and printers.

There is no limit to the number of tiers in a Directory Information Tree. Additional tiers can be added by hanging off any level of the hierarchy. For instance, any number of organisational units can hang off a single organisation in the tree. However, the number of levels should be kept to a manageable number. To allow objects to be located easily within the directory tree and for their relationships to other objects to be seen clearly, names are expressed by stating the path from the common name to the root of the tree, much the way that most computer file systems are organised into directories and subdirectories.

Along with the name attribute of an object, the DIB stores many other attributes and their values, which can be assigned to specific object types. For instance, these attributes can include the fonts available on a given laser printer in the network, or the employee number of a given user. Each object can have a range of attributes; attributes for a PC, for example, can include owner, operator, locality name, network address, serial number, and status.

Unlike the bindery and NNS, which are decidedly limited when it comes to dealing with third-party applications, NDS is completely extensible. Additions to the DIB structure can be made by third parties. Novell has defined a Directory Schema, a standard set of data types for the information stored in a directory. Simple data types could be strings of characters or numbers of a certain range. Additional types can be defined by network administrators and third-party developers. This feature can enable network administrators and third-party applications developers to merge many different databases, even those unrelated to the network, into the DIB.

DIB Distribution

Compared with the NetWare bindery, NDS offers much easier access to remote facilities. The bindery allows resources attached to a remote server to be located only by directly accessing the bindery of that server. NDS provides a more efficient way to locate remote resources. Under NDS, directories and portions of directories are replicated throughout a network on servers designated by the network administrator. With this approach, a local listing of needed resources located throughout the network is always available to users. These local listings improve response time and eliminate the need to use costly WAN links to locate remote resources.

The replication scheme used by Novell balances the need for local access to network-wide directories with the need to conserve network resources. Most servers do not maintain a full directory of all the resources in a network; instead, they store only a portion of the entire directory. These portions, or partitions, typically contain information only about those resources most often needed by users within the server's primary user group.

A partition consists of a major subtree of the overall network directory. In the figure, everything beneath and including OU=Research is a partition. To expedite local access, a copy of a partition, called a replica, can be stored on other servers. Each replica falls into one of three categories: Master, secondary, or read-only.

Only master replicas are used to add new partitions to the Directory Information Tree. Master or secondary replicas can be used to create, modify, or delete objects. Read-only replicas can be used to read directory information, but they cannot be used to write to the partition. Based on user of administrative access patterns, administrators can determine which partitions should be replicated, and where they should be replicated.

The Update Process

Binderies are either maintained separately or synchronised by NNS through the unsophisticated copying process described earlier. To deploy NDS information across multiple servers and to coordinate the many partitions, Novell has developed a new set of distribution and time synchronisation services. As changes are made to partitions, all replicas of the partition are updated automatically, although updates are not necessarily immediate. The NDS directory is a loosely synchronised database. Loose synchronisation means that changes are not always copied to replicas immediately. This greatly reduces the amount of overhead needed to maintain a partition and its replicas. This is also particularly useful when dealing with very large-scale, dispersed LANs, especially those joined by low-speed WAN links.

Replica synchronisation is accomplished by what Novell calls a partition synchronisation process, which will be implemented in the NetWare Loadable Modules (NLMs) that make up NDS. When a server receives a change or update, it notifies the partition synchronisation process, which takes action according to the partition's convergence value. This value indicated how quickly updates must reach replicas. A high convergence value causes the partition synchronisation process to make an immediate attempt to update all replicas any time a partition is changed. When the convergence value is low, the process does not update replicas until the next scheduled synchronisation cycle. Convergence values are assigned to partitions when the partition is created.

When it is time for an update, the partition synchronisation process goes through the list of replicas, updating each one in turn. If the synchronisation fails to update a replica for any reason, the partition synchronisation process will attempt to update those partitions during the next scheduled synchronisation cycle.

Because the partition synchronisation is not necessarily immediate, NDS is not really appropriate for storing object values that may change frequently. Generally, however, short-term discrepancies among replicas are not significant if NDS is used to keep track of user access rights and network resources. For instance, it usually isn't crucial to get such changes as new users or services to every replica immediately.

The partition synchronisation process makes changes to all name servers based on changes made to any master or secondary replica at any location. To avoid problems that could arise if the same object were changed at two different servers, each partition is marked with a time stamp of the last change. Time stamps are compared during the synchronisation process to ensure that the most current date is used. The timestamp

NetWare and Mainframes: A More Perfect Union

A few years back, the thought of giving PC users direct access to the mainframe's processing power caused even the most battle-tested information managers to break out in a cold sweat. Given a choice between providing a PC with a direct line to the mainframe's high speed channel or putting a nest of mainframes on the San Andreas Fault, many managers may have seriously considered taking their chances with plate tectonics. Today, of course, those managers have to confront their PC fears head on. As enterprise computing moves toward reality, the merger of PC local area network and mainframe resources has become inevitable. The enterprise model absolutely requires the unrestricted exchange of information among all types and classes of computers. Terminal emulation links between PCs and mainframes simply aren't strong enough for the job.

The largest forces in the PC LAN and mainframe worlds — Novell and IBM, respectively — have recognised the need to forge a much stronger connection between their two domains. With the help of Novell, IBM has created LAN Resource Extension Services (LANRES), a product intended to give PC users on Novell NetWare LANs virtually transparent access to IBM mainframe data and resources, such as printers. LANRES does this by providing a NetWare server with a direct attachment to a mainframe channel, the mainframe's equivalent of a PC bus. Depending on the IBM mainframe model, that channel operates at speeds up to 4.5 Mbytes/second. In fact, LANRES is the first major product from IBM to offer PCs a direct link to the mainframe's channel.

The US-based Data Comm Test Lab has put the initial release of LANRES through a series of informal tests and has found the package all that Novell and IBM claim it to be. With LANRES, NetWare users can gain access to mainframe resources as easily and quickly as they can with NetWare server resources. No complicated procedures or terminal emulation programs are needed; the same DOS commands and applications that provide access to server data offer entry to the mainframe. The tests showed access to data stored on the mainframe to be transparent and fast enough as to be indistinguishable from access to server-stored data. In fact, Novell's Perform 3 benchmark showed performance in some cases to be even faster when the mainframe's disk was being used instead of the disk installed in the NetWare server.

All this is very good news for NetWare users. But what about those wary mainframe managers? In evaluating LANRES, the Lab conducted several tests to determine whether certain LAN disruptions would cause other mainframe operations to crash. In these tests, the mainframe continued to operate, and other peripherals connected to the same main-frame channel as the PC suffered no ill effects.

The initial version of LANRES does have some flaws. One drawback is that it is available only for IBM PS/2 computers equipped with a Micro Channel bus. Although Micro Channel is IBM's preferred PC platform, many NetWare sites rely on AT-bus servers. The package also may be difficult to install, especially for staffers who lack experience with both NetWare and IBM mainframe environments.

Aside from these minor faults, LANRES is a well-crafted offering. In addition to giving NetWare users access to mainframe data storage and hardware resources like printers, LANRES allows for the centralised administration of NetWare servers. Almost any server configuration function that can be performed with NetWare's SYSCON and PCONSOLE utilities can be performed from the mainframe. With LANRES, data stored by PC users on the mainframe can be backed up using whatever backup and archiving system exists for the mainframe. This feature is useful: In most corporations, backup and archiving systems used for mainframes are far more sophisticated than anything used for LANs.

Breaking Through

It was no secret that direct channel attachment could bring incredible performance improvements to communications products like SNA gateways. But those responsible for the care and feeding of mainframe resources cringed at the idea of making their systems vulnerable to the whims of a technology they perceived as unruly and quirky. Data centre managers weren't alone in worrying about giving PC users a direct link to the mainframe channel. IBM has spent years fretting over the consequences. Its first attempt to integrate the worlds of LANs and mainframes was a half-hearted effort and an unqualified failure. In 1986, IBM released Enhanced Connectivity Facility (ECF) as part of its 3270 emulation software for DOS, and then as part of OS/2 Extended Edition. ECF was supposed to do what LANRES does — give PC users transparent access to mainframe resources. Not only did ECF fail to do that, but the package turned out to be very expensive.

Apparently, IBM has come to grips with its fear of integrating PCs and mainframes. LANRES is further evidence of IBM's acceptance of computer integration. Release 1 of LANRES is available for IBM mainframes running under either the VM or MVS operating system. Attachment to a NetWare LAN is via a LAN server running

NetWare version 3.11 or higher. The server is attached to the IBM mainframe channel via a channel-attachment add-in card sold with LANRES. This add-in card is available in a Micro Channel version only, which means LANRES works only with PS/2 NetWare servers. This limitation is not as problematic as it may seem, however, because a single LANRES-equipped server can provide a mainframe connection to all non-Micro Channel PCs and servers in a NetWare internetwork (see figure below).

Basic Functions

LANRES performs five basic functions: Disk serving, data distribution, LAN-to-host printing, host-to-LAN printing, and LAN administration. Each of these five functions is implemented in a separate program for the mainframe and a separate corresponding NetWare Loadable Module (NLM) for the NetWare server. The modular design means that additional functions can be added in subsequent releases of LANRES. For instance, IBM has said it will produce a version of LANRES compatible with its LAN Server operating system. This points up the possibility that future modules will be created to enable LANRES to integrate LAN environments that now are incompatible.

The LANRES disk-serving program effectively allows NetWare users to treat host disks as if they were NetWare volumes; the volume on the host disk is formatted as if it were a NetWare disk. This not only gives NetWare users ready access to vast amounts of mainframe storage, but it also can help organisations save money, since mainframe disk drives, on a cost-per-byte basis, typically are less expensive than PC disk drives. NetWare users also benefit from having their mainframe-stored data protected by existing mainframe backup and archiving systems. The data distribution function of LANRES allows data from mainframe applications or binary files stored on a host to be moved from the mainframe to NetWare storage. Translation of data from EBCDIC to ASCII is performed automatically. This facility opens the door to the possibility of using corporate mainframes to distribute software electronically to NetWare servers.

For print services, LANRES provides two-way links between the mainframe and LAN environments. LANRES includes the necessary translation routines to allow text files and Postscript files to print on mainframe printers when appropriate. Exit routines allow in-house programmers to create their own translation routines. LANRES also lets mainframe users send print jobs to attached NetWare servers.

Network managers typically handle such tasks as assigning passwords and file access fights and allocating disk space using NetWare's SYSCON utility. LANRES lets administrators perform most SYSCON functions from the mainframe command prompt. Although the mainframe command prompt may not be as intuitive as SYSCON's menus, it allows administrators to make use of Restructured Extended Executor (Rexx), IBM's high level scripting language. Rexx can be used to write programs that automate the issuance of SYSCON commands and to create front-end programs that make SYSCON operations easier to perform.

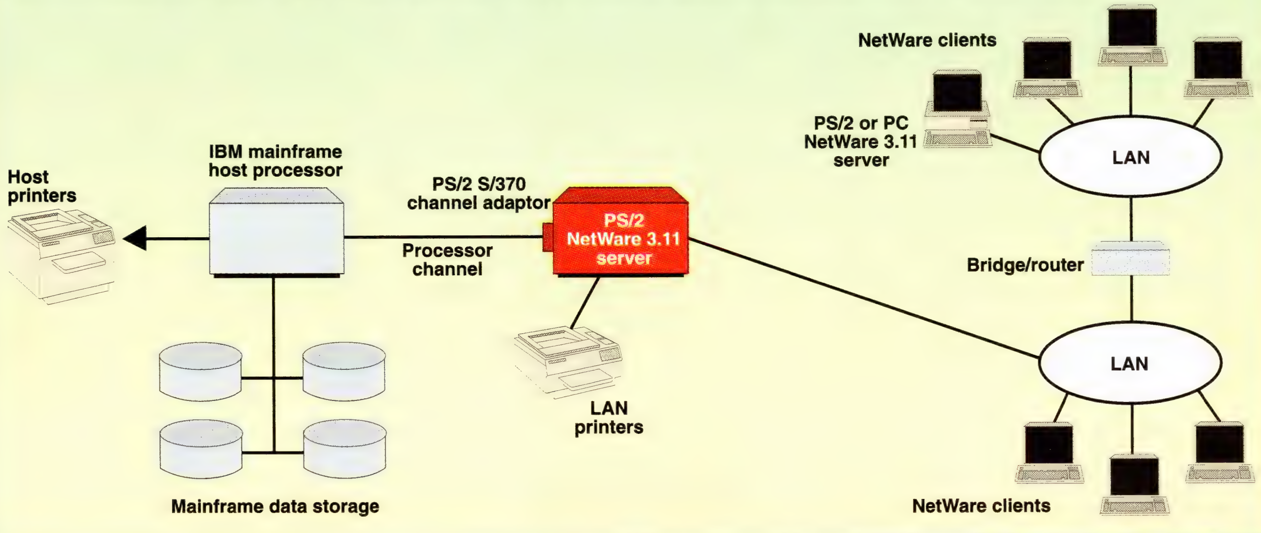
In evaluating LANRES, the Lab considered five basic factors: The transparency of the mainframe connection to end-users, the performance of the link, its reliability, the program's ease of installation and use from the perspective of the LAN administrator, and the overall cost of LANRES. Lab personnel tested all the commands and functions provided by each of the five previously mentioned LANRES functionality categories (disk serving, data distribution, LAN-to-host printing, host-to-LAN printing, and LAN administration).

The tests were run to provide a general indication of performance, rather than to construct an exact evaluation of the package. One reason for this is that LANRES performance will vary because of several factors. One is the type of IBM mainframe used; the tests conducted by the Lab were done with an IBM Model 9370, a relatively low-end machine. The channel on the mainframe was set to operate at only 2.7 Mbytes/second; however, during tests, including the running of Novell's Perform 3 benchmark, the mainframe was only lightly loaded with other tasks — a scenario unlikely to exist in corporate computing environments. The server used in the evaluation was an IBM PS/2 Model 70-A61 running NetWare Version 3.11.

The tests showed that, for the end-user, transparency has been achieved to the utmost degree. In the tests, LANRES flawlessly handled all typical end-user operations, such as reading or writing files and displaying directories. Testers were able to perform these operations without making any modifications to end nodes.

The LANRES PS/2 Linchpin

LANRES provides a direct mainframe channel attachment to a PS/2 NetWare server equipped with a channel adaptor and cabling. The server also is connected to a Token Ring or Ethernet segment, giving all interconnected NetWare nodes access to the mainframe.



NetWare and Mainframes (Cont.)

The degree of transparency of course is affected by performance; if response time increases for mainframe disk storage, end-users certainly will notice the difference. This was a lethal problem for ECF, which ran on top of a 3270 data stream — which made ECF response time significantly slower than normal LAN response time.

The Lab ran Novell's Perform 3 benchmark to gauge the performance of LANRES. Perform 3 does a series of read and write operations between servers and clients, measuring the number of these operations that can be performed in a set amount of time. The Lab ran Perform 3 between one client and its NetWare server, and then between the client and the NetWare server when the server was using the mainframe's disk. In these two configurations, Perform 3 tests showed almost identical results. In the Perform 3 test titled 'Open/Close File (Multiple directories),' the Lab's 9370 configuration performed 124.90 operations in the allocated time period. The NetWare server using its own disk performed 126.45 operations in the same time frame. Results were even closer for tests involving reads of small (4 kbyte) shared files and large (4 Mbyte) shared files. In the other Perform 3 tests, the mainframe configuration actually outperformed the server's own disk.

Fear of Crashing

While performance is a critical factor for LANRES, reliability rates as a top concern, especially for mainframe managers. Every mainframe channel handles a number of devices and functions, such as printers, links to other mainframes, and disk drives. Many managers of mainframe systems are wary of throwing PCs into this mix.

The Lab conducted several tests to determine the effect that events like power cuts and channel disruptions would have on the mainframe and its other operations. The results in the Lab indicate that fears of constant crashes or even permanent damage to the mainframe are unfounded. When testers unceremoniously cut power to the channel-attached server, the mainframe's console displayed error messages, but the mainframe continued to operate flawlessly. When the server was rebooted, it reestablished links without a hitch.

LANRES does come up short when it comes to ease of installation. The documentation that comes with LANRES actually is extensive, and the installation procedures for the NLMs and mainframe components follow accepted practices. The problems have more to do with installing and using a product that integrates two very different computing platforms. Because LANRES has both NetWare and mainframe components, it requires installers to be intimately familiar with both environments. Lab staffers have the needed expertise, but staffers at a typical corporation may not. The LANRES documentation shows evidence of the dichotomy between the PC and mainframe worlds. Specifically, the documentation has no step-by-step, start-to-finish explanation of how to install LANRES. Instead, separate sections explain operations to be performed on the NetWare server and on the mainframe, respectively.

This lack of a cohesive presentation is a vexing problem. As a platform-integrating product, LANRES must perform a considerable amount of 'virtualisation' — that is, it must fool the NetWare server into thinking it is dealing with another NetWare server, while at the same time it must fool the mainframe into thinking it is dealing with a conventional mainframe resource. Unfortunately, the documentation does not clearly explain how LANRES pulls this off.

Two features provided by LANRES also are worth noting. One, which is part of the program's distribution services functionality, is an assembly language application program interface (API) that allows a host program to access NetWare files in binary format. Besides reading and writing files to the server, the API allows binary files to be examined starting at particular offsets. This API could provide the basis for much third-party software, from electronic distribution to virus checking.

It also is worth noting that NetWare's native security system is not compromised when a 3270 terminal is used to perform administrative functions under LANRES. The NetWare bindery still determines access rights for the 3270 terminal user. NetWare managers need not worry about the possibility that LANRES will provide a back door into NetWare servers and data. All things considered, LANRES is an impressive product. It is far superior to any previous offering, such as ECF, when it comes to integrating IBM mainframes and NetWare servers.

The chances are very good that LANRES will not have the field to itself for long, however; there are at least two other products now in the works from other vendors that will provide PCs with direct mainframe channel attachment. When word about LANRES gets out, more such products can be expected.

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function is part of the Time Synchronisation Service, implemented in an NLM that comes with NDS.

The service coordinates and constantly corrects the time on all name servers; it also compensates for differences in local time zones. Novell built the service to be effective across both local and remote links, regardless of link speed. Novell says the service should keep servers synchronised to within tens of milliseconds of one another.

Authentication and Access

NDS provides enterprise-wide access to information pertaining to every device and user of the network. This freer availability of information increases the need to make sure the network is secure. To ensure network security, NDS provides both user authentication and access control. Novell worked with Californian-based RSA Data Security, a third-party software developer, to develop a private/public key cryptographic system for NDS and NetWare 4.0. Under the authentication system developed by Novell and RSA, when a user initially logs onto the network, the server and client establish a proof of identity based on the user's password and the environment to be used for the session. This robust proof of identity has not been part of previous versions of NetWare. The complex process involved guarantees that subsequent messages during the session are coming from the duly authorised workstation. It also verifies that each message has been generated during the current session, does not contain any counterfeited information from another session, and has not been corrupted in any way.

Each server has an access control list, which keeps track of all objects and their ability to read or alter other objects in the directory. These lists are established when a partition, or server, is created and objects are added. Access control lists provide much more flexibility in assigning access rights than is possible under the NetWare bindery. Bindery-based versions of NetWare have four basic user classifications: Supervisor, Workgroup Manager, Manager, and User. Each level designates a scope of privileges to change the contents of the NetWare bindery. A Supervisor can add and change any user on the server, while a user can alter only certain aspects of its own description.

Client Directory Access

To access directory information, a user must have sufficient access privileges, as defined in the access control lists. Under NDS, a user or application can access directory information in three different ways: Lookup, browsing, and yellow-paging.

Of the three access means, lookup probably is the most instinctive way to access directory information. With lookup, a user identifies a needed object either by name or by specifying additional object attributes. The browsing function lets users navigate

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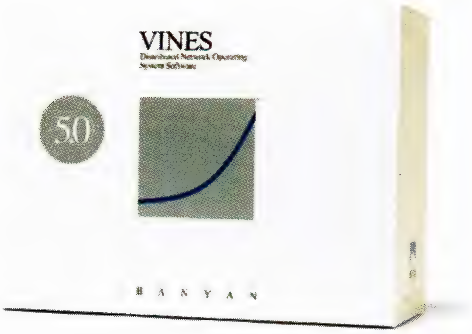

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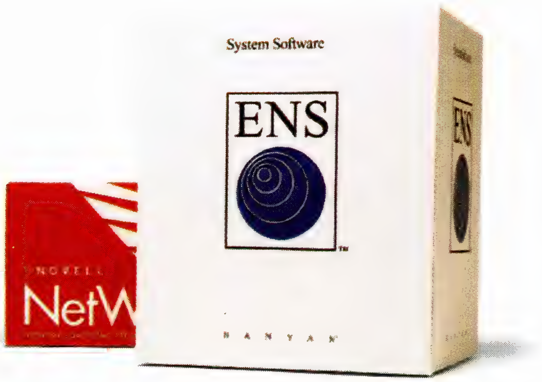
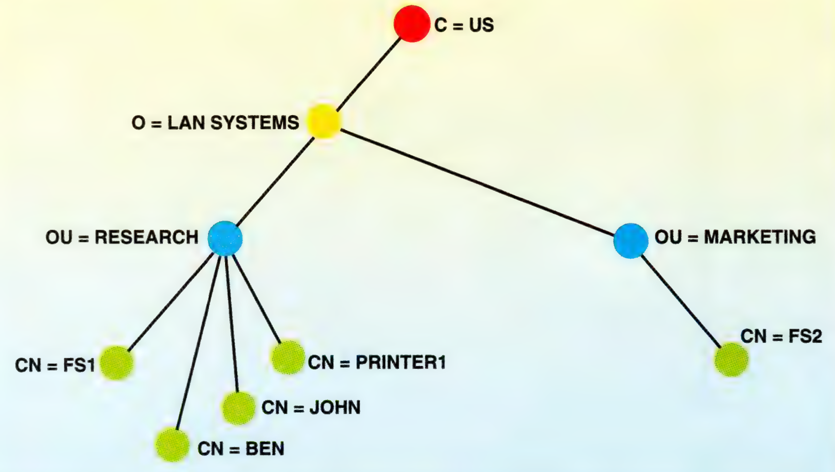


A Tree Grows in NetWare

Relationships between objects in the NetWare Directory Services are represented by a tree diagram. An object is referred to by stating the path from its Common Name (CN) to the root of the tree (C).



through the Directory Information Tree, viewing objects and attributes in an ad hoc fashion. Of the three access methods, yellow-paging is by far the most powerful. The yellow-paging function gives users the chance to comb through general categories within the directory. As with the Yellow Pages in a telephone book, the user searches for objects by category, and the directory returns objects that fulfill the criteria.

Installation and Compatibility

The value of NDS and all its features and functions would be compromised if the improvements made NetWare more complicated for users and administrators, or if they made NetWare 4.0 incompatible with existing versions of the operating system. To keep NetWare from becoming more difficult to deal with, Novell had to take steps to keep NetWare 4.0's complexity transparent. One of the ways that the vendor hopes to achieve this is by making the installation process easier then ever.

According to Novell, NetWare 4.0's installation utilities will be able to perform upgrades from any NetWare version as far back as NetWare 2.0A. Users will be able to perform the upgrades in several different ways. For instance, an existing NetWare server may be upgraded from another server on the network via a network connection. In this scenario, NetWare 4.0 is installed on a new server, and data from an existing server is transferred to the new server. Alternatively, administrators can transfer data from an existing server to a backup device, install NetWare 4.0 on the initial server, and then retransfer the data back from the backup device to the upgraded server.

NetWare 4.0 also features an upgrade utility that allows an existing server to be upgraded 'in place.' With this utility, data and binderies are reformatted without requiring backup and restore. Of course, backup is recommended to protect data in case problems occur. Since these upgrades functions are handled through utility programs, upgrades could be written for non-Novell operating systems, such as Banyan Vines and Microsoft's LAN Manager. In fact, Novell plans to add this capability — although it won't necessarily by rolled out with the release of NetWare 4.0.

To ensure compatibility, NetWare 4.0 offers the Bindery Emulation Service. When it is turned on, every applicable object in the directory partition is represented in bindery form in addition to its standard NDS form. With bindery emulation, when a NetWare 2.X or 3.X client tries to log onto a NetWare 4.0 server, the client is presented with the standard 2.X or 3.X log-in prompt, and everything proceeds as if a 2.X or 3.X server is being accessed. Of course, the client must have a valid user name on the target server, just as before. Functions specific to NetWare 4.0, such as yellow-paging, are not available to 2.X or 3.X clients.

NetWare 4.0 client software also works with NetWare 2.X or 3.X servers. If a NetWare 4.0 client attempts to access an older server, the user is presented with the 2.X or 3.X log-in prompt All functions provided by the older server are available to the 4.0 client. An added feature that will facilitate multi-generation NetWare networks is the inclusion of bindery-based objects directly in the NetWare 4.0 directory.

For network managers seeking to protect existing investments in NetWare-specific applications, there's both good news and bad news. The good news is that the NLM application specification is being carried forward to NetWare 4.0. In theory, all existing NLMs that use the NetWare CLIB interface should work with the new NetWare. NetWare 4.0 remaps 3.X function calls to their newer counterpart functions. When a 3.X NLM is loaded, NetWare 4.0 issues a console message stating that the loaded NLM uses old function calls, presumably to alert users that the NLM is less than state-of-the-art.

The bad news is that any NetWare 3.X NLMs that bypass APIs for whatever reason may not be completely compatible with NetWare 4.0's memory management scheme; in the process, it has changed the way an application has to interact with NetWare if the application accesses the operating system directly.

Another compatibility issue — one that has cropped up with almost every NetWare revision to date — pertains to backup applications. With every new generation of NetWare, the publishers of third-party backup applications have had to revise their products to make them compatible. With NetWare 3.X, Novell introduced the Storage Management Services (SMS) specification. The basic idea behind SMS is to provide a client-server backup system that is effective across not only different NetWare versions but also non-NetWare systems.

Performance Maintained

Surprisingly, all of the added features and functions incorporated into NetWare 4.0 are not expected to exact any performance penalties. To compensate for any extra overhead caused by NetWare 4.0's new features, Novell has made several enhancements to its operating system, such as improving the memory management system. The vendor says 4.0's performance should be about the same as or slightly better than that provided by NetWare 3.X. If Novell's claims are accurate, NetWare 4.0's performance will be impressive, considering that the NetWare Directory Service has a host of new processes running full-time to handle new services.

Assuming that Novell delivers on all its promises, NetWare 4.0 clearly is a major step in the direction of enterprise network management. It's obvious that Novell has been listening to its strongest supporters as well as its loudest detractors and has responded with an enterprise solution that appears to be worth waiting for.

Companies with multiserver, multilocation networks probably will be first in line to put NetWare 4.0 to the test. Organisations with network expansion on the horizon should consider NetWare 4.0 as a platform for their growing needs. By making NetWare 4.0 compatible with existing NetWare versions, Novell is giving its customers the freedom to make a gradual migration to its next-generation operating system. In the long run, this strategy could only help NetWare 4.0 attract more users.

Ben Ruiz and John Herron are Directors of the Research and Consultancy Group for LAN Systems based in New York, a systems integrator for organisations with large-scale LANs and WANs.

IDAs and the Failure of Industry Policy

The Industry Development Arrangements have now been extended to 1996. But has the scheme been successful? Dr Terry Cutler argues that it's actually worse than having no industry policy at all.

The 'Canberra factor' in telecommunications is alive and well. For all the talk about deregulation and the positive evils of picking policy winners, it is difficult to think of any sector where political and regulatory risk looms so large and continues to create such a high level of uncertainty for industry.

After five years of the Government's 'structural adjustment' programme for microeconomic reform, three observations can be made:

- Industry gets very mixed messages from Canberra;
- Canberra gets its telecommunications very mixed up; and
- Positive and effective industry development strategies are more likely to emerge from industry than politicians and bureaucrats.

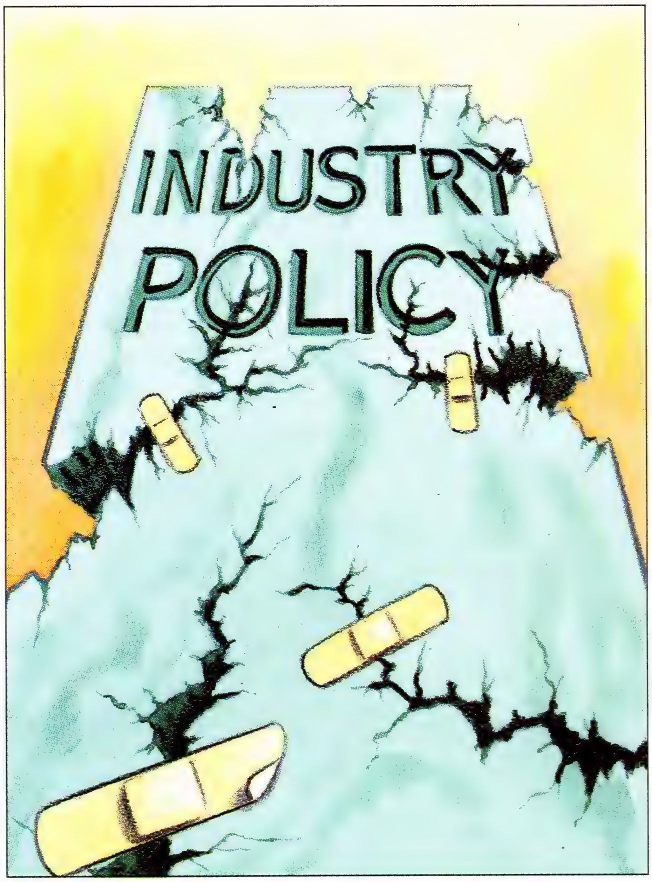
Mixed messages are the natural consequence of the policy potpourri, where multiple and inconsistent policy agendas are promulgated simultaneously. This policy confusion is summed up very neatly in Figure 1 on page 96, taken from a recent paper prepared by Siemens.

Confusion about industry definition and categorisation compounds these mixed policy approaches. Two factors appear to feed this confusion. First, there is the policy partitioning across different Departments — such as the turf battles between the Departments of Transport and Communications (DOTAC), and Industry, Technology and Commerce (DITAC) — that has nothing whatever to do with industry or market realities. Secondly, industry issues are forced into categories like 'manufacturing' and 'equipment' or 'services,' 'carriers' and 'GBEs' and are then dealt with on a segmented and standalone basis.

Such partial and lopsided industry approaches do not work very well. The obvious reason for this is the cross-impacts of global market and technological developments affecting all industry participants. Government needs to re-examine the way it divides the industry into equipment and services. With rapid changes in both manufacturing processes and the organisation of service delivery, traditional industry roles and relationships are changing. Most importantly, these changes take place in a world where it is now impossible for either companies or Governments to quarantine and isolate domestic markets for particular treatment.

All this supports the conclusion that positive and effective industry development strategies are more likely to emerge from industry than from Canberra. Industry development strategies need to be driven by the firms that carry them through. The role of Government is to shape a positive and attractive investment environment.

During 1992 the Canberra machine worked assiduously to add new case studies to support these conclusions: Pay Television, spectrum management; the proposals for a Telecommunications Export Marketing Task Force.



As a case study of recent policy making, however, the Industry Development Arrangements (IDA) scheme is as good as any to examine. This scheme for telephone terminal equipment was first introduced in 1988 as part of the Government's first package of decisions for restructuring telecommunications. The scheme restricts market participation to firms achieving a mix of local production, R&D, and export targets. At the end of 1992 a revised scheme was launched, to carry through to 1996.

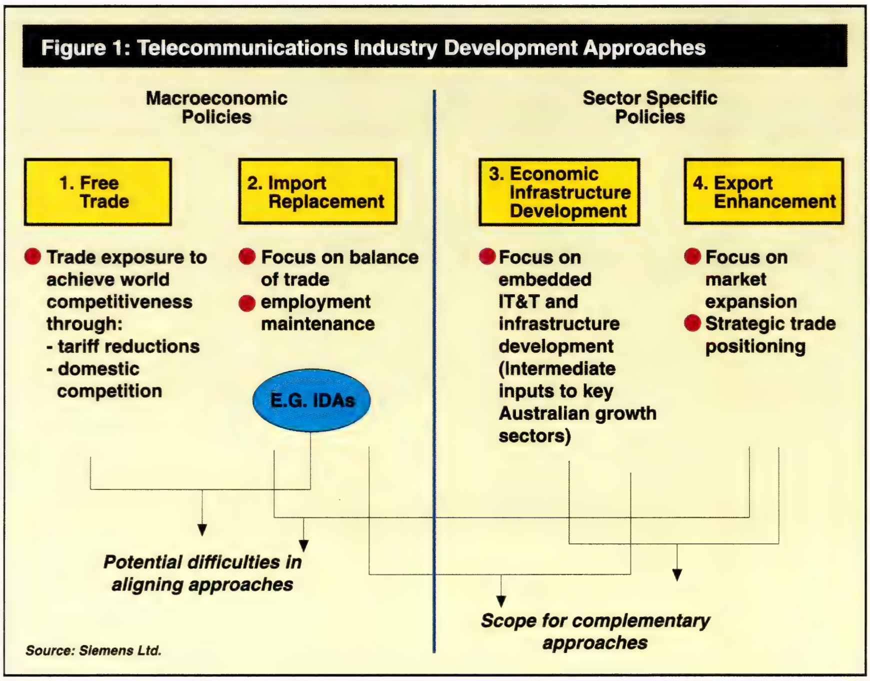


Figure 1: Telecommunications Industry Development Approaches

Macroeconomic Policies
Sector Specific Policies
1. Free Trade
2. Import Replacement
3. Economic Infrastructure Development
4. Export Enhancement
● Trade exposure to achieve world competitiveness through:
- tariff reductions
- domestic competition
● Focus on balance of trade
● employment maintenance
E.G. IDAs
● Focus on embedded IT&T and infrastructure development (intermediate inputs to key Australian growth sectors)
● Focus on market expansion
● Strategic trade positioning
Potential difficulties in aligning approaches
Scope for complementary approaches

Source: Siemens Ltd.

The new scheme introduces a two-tier regime. The first tier comprises the larger multinationals who sign up with the Government for Partnerships for Development Program (PDP) or related schemes covering their overall corporate activities in the country. These companies will now be exempted from the IDA scheme. The second tier covers smaller companies, or those without a diversified base of activities, who will be required to meet a tougher set of requirements with respect to local content.

For reasons I will go on to argue, this new 'hybrid' scheme is probably a step in the right direction, but it still fails to address many of the fundamental problems inherent in the old scheme and in the Government's approach to this industry generally.

The 1998 scheme was doomed to failure. So is the new hybrid scheme and any other policy improvisation that is at odds with industry and market realities. One of the persistent problems with industry policy for telecommunications is that we all tend to suffer from collective amnesia: We forget why we got ourselves in this or that mess of makeshift policy. The IDAs provide an excellent case study of political 'second best' solutions, and the triumph of vested interests and short-term thinking against national industry development for the long term. Looking behind the IDA policy debate provides some valuable insights and lessons for the future.

The Policy Background

Two key developments have influenced the industry's directions over the past 20 years. First, in the 1970s the Whitlam Government's tariff cuts destroyed a nascent component manufacturing industry and with it any prospect of Australia participating in the emerging computer hardware industry. The rapid growth in the computing area, fed by rising equipment imports, subsequently led to pressures for 'import replacement' policies which gave birth, in 1987, to the Government's Information Industry Strategy. Whatever else the Partnerships for Development Program may have achieved, it has singularly failed to alter the adverse balance of trade in data processing equipment. This trade imbalance has worsened by 43% since 1987-88, and now stands at $2,624 million.

Second, a private market in telecommunications equipment began to develop from the early 1980s, with the gradual liberalisation of CPE supply and the faster exploitation of new private network opportunities. Towards the end of the 1980s, and in the context of mounting pressure for increased competition in network services, attention turned to the formulation of a telecommunications counterpart to the Information Industries Strategy. As it happened, however, this was to be a more piecemeal exercise.

Throughout this period the Government industry agenda was driven by DOTAC, on the services side, rather than DITAC on the equipment side. As a result, the priority has been on the regulation of carrier services, rather than on equipment supply or manufacturing. (The linkages across the business systems of telecommunications continued to be ignored by all).

DITAC, in 1986, developed an equipment export development strategy. In 1988, as a *quid pro quo* for the liberalisation of CPE markets, the Government introduced its IDA scheme for telephone CPE.

IDAs: A Political Not a Policy Solution

The IDA scheme was introduced for all the wrong reasons. It was introduced in response to union pressure in 1988, in an attempt to protect Telecom's 'first phone' monopoly and to maintain CPE employment within Telecom in the wake of CPE deregulation. This lobbying was supported by the incumbent manufacturers, who saw — and still see — the scheme as a very effective way of locking out new entrants.

This scheme, therefore, was designed primarily to prop up industry employment and to counter any prospects of a blowout in imports. It assumed that the carriers would continue to maintain 'in-house' distribution of CPE as part of their traditional approach to 'end-to-end' service.

Overblown Significance

The IDA scheme has assumed a prominence in industry debates out of all proportion to its real significance. Never lose sight of the fact that *it barely covers one third of the total Australian CPE market, and only about 15% of total equipment industry output.*

The Australian telecommunications sector is dominated by a small number of multinational companies on the supply side, and by AOTC on the demand side. The Australian telecommunications equipment industry shipped approximately $2.8 billion of goods to domestic and export markets in 1991. It is dominated by two multinational firms, Alcatel and Ericsson, each of which has telecommunications revenues in excess of $500 million. On the demand side, AOTC remains the core customer for telecommunications equipment, and the dominant network carrier. The importance of AOTC as a customer is clear from Figure 3 on page 97. Expenditure on network equipment is significantly higher than on CPE (see Figure 4 on page 97).

The $1 billion CPE sector is not one market. There are a number of segments, each with a different competitive structure. This sector also includes the fast growing area of private network equipment, especially PC LAN interconnect systems.

The introduction of network and cellular competition will ensure that the network equipment market remains strong, whereas the telecommunications CPE market is more mature, and overall growth in traditional telephone CPE such as PABX and Key Systems is slowing significantly. The exception here is the high-growth cellular mobile terminal market.

The total value of this IDA market is not large: Around $385 million in 1991-92, spread across no less than 27 firms. Figure 6 on page 98 distributes segment turnover — on a pro rata basis — across the number of participating suppliers to reinforce this basic point that the scale — and hence the potential impact — of the IDA scheme is very limited.

It is clear that a scheme of this type will benefit and protect the incumbent manufacturers who supply across multiple product types and, most of all, favours those suppliers who are active in both CPE and Network equipment supply.

The IDA Scorecard

Has the IDA scheme achieved any of its objectives? Figure 7 on page 98 summarises the achievements of the scheme to the end of the third year. Figure 8 on page 98 presents the industry development parameters of the scheme — local production, exports, and R&D — as a percentage of overall turnover.

In assessing the relative success of the IDA scheme so far, it is important to remember that it did not start in 1988 as a greenfields exercise: It emerged from a highly protectionist environment where Telecom was the monopoly distributor. The presumption was that the IDA scheme would be sufficient to maintain the established industry base into a less regulated regime. Against the objective of preserving the pre-1988 industry structure, the picture presented by Figures 7 and 8 is not encouraging:

- Net imports for total CPE continue to grow;
- The Australian production involved is low value-added: Local content as a proportion of Australian production is disappointingly low. (Actual Australian local content contributed only around 35% to the total value of Australian production in 1991/92).
- Gross research and development levels are trivial in the context of global product innovation; and alternative mechanisms are available to encourage greater R&D in the industry at large.
- Export levels are insignificant, and net imports are growing.

The time series data in Figure 9 on page 98 suggests that export growth has plateaued, but that imports look set to return to their pre-1990 levels.

It is common wisdom around the industry that both the export and R&D elements of the IDA points scheme can be manipulated on a short-term basis by suppliers, without requiring any long-term commitment to investment in Australian industry development. Any prospect for significant — *or sustainable* — export levels in these product areas is extremely limited.

The scheme has not, in practice, provided any sustainable incentives for multinationals to consider global mandates for the location of regional manufacturing in Australia. As reported in the 1991 Allen Consulting Group study for DITAC (*Developing Telecommunications Industry Strategies in Australia*), most local manufacturers actually say they would cease or wind back local production in the absence of the IDA scheme because of:

- The lack of a local component industry; and
- The fact that product assembly is low value-added, and not related to any inherent local competitive advantage.

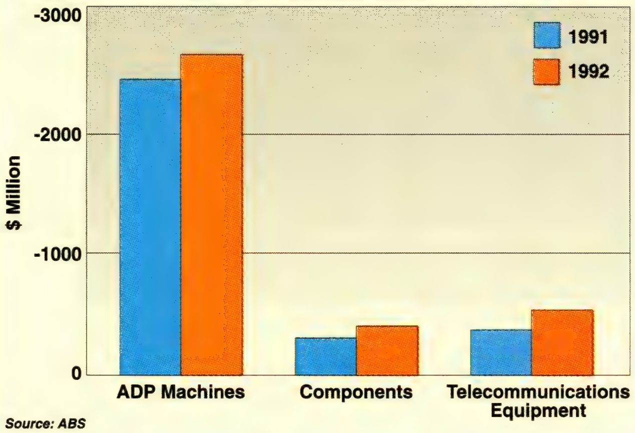
Inherent Weakness

The IDA scheme was conceived within the mindset of 'production line' manufacturing and employment protection.

There is potential for industry employment growth, but is not in the area of automated assembly line production. It is in the labour-intensive and skill-intensive areas of software engineering, service applications development and supply, and service maintenance and upgrades. The best and latest examples of this are to be found in the area of digital cellular services and related smart card technology, where local investment would be a smart thing for purely commercial and competitive reasons, but which have in fact been seized upon as the latest excuse to extend the IDA scheme.

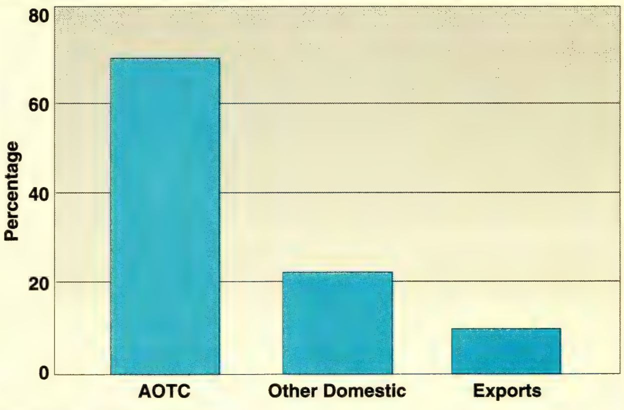
The outdated focus on hardware assembly, in its own right, only distracts attention from the increasing opportunities for local software design and engineering mandates, within a global production environment; these are now the key elements in product

Figure 2: The Balance of Trade in IT&T



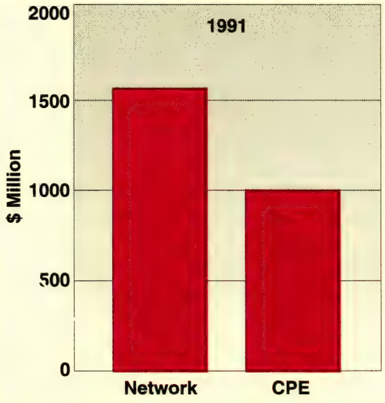
Source: ABS

Figure 3: Communication Equipment Shipments 1991



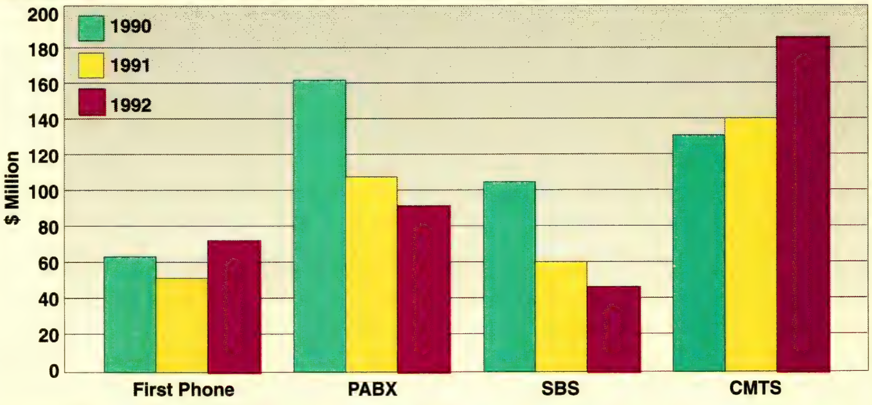
Source: Cutler Consulting analysis

Figure 4: Aust. Equipment Market



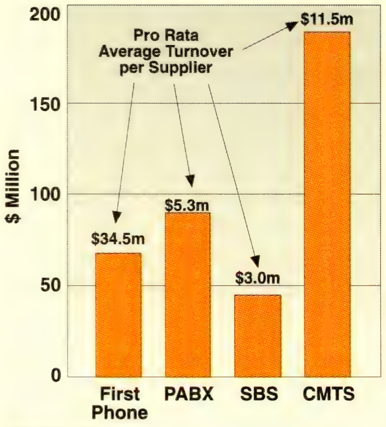
Source: ACG 1991

Figure 5: IDA CPE - Turnover by Product Segment



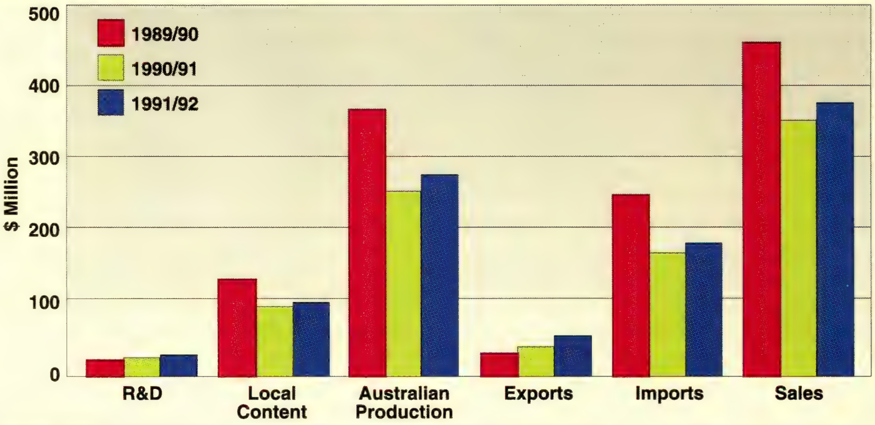
Source: Austel

Figure 6: IDA Turnover



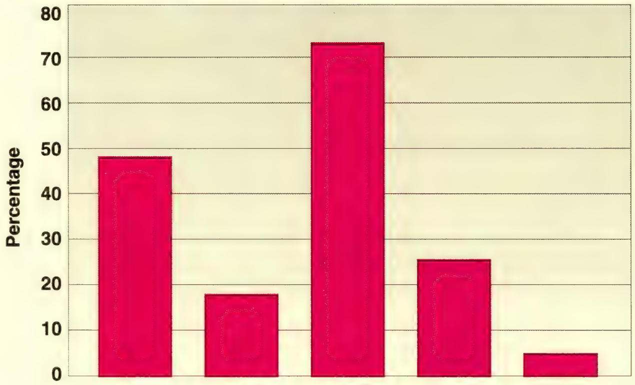
Source: Austel

Figure 7: IDA Scheme Overview



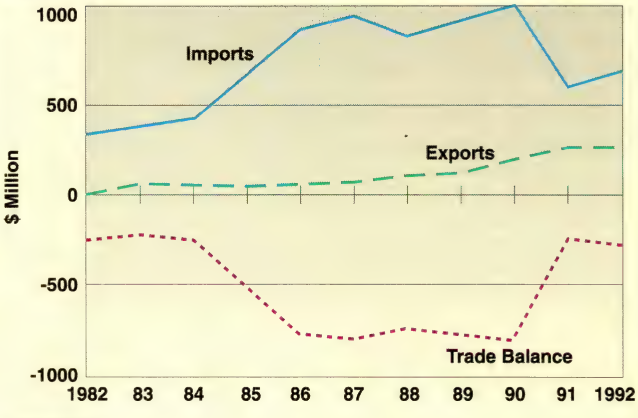
Source: Austel

Figure 8: IDA Year 3 Results as a % of Turnover



Source: Austel

Figure 9: Telecommunications Equipment Trade Balance



Source: ABS

innovation and competitive advantage in this CPE market.

Unintended Consequences

The Industry Development Arrangements have had three wider, and anti-competitive consequences. The scheme happily serves — as its original proponents entirely intended — to protect and reinforce Telecom Australia's entrenched position in these IDA markets. Traditionally, most suppliers relied on direct access to carriers. By maintaining Telecom's dominance in equipment distribution and maintenance, the IDA scheme has inhibited the development of alternative distribution channels that are an essential prerequisite to a more competitive market in telecommunications.

On the supply side, the IDA scheme has helped to delay a long overdue rationalisation of the industry. There are simply too many local suppliers for the size of the market. Past industry policy has produced scope — we have tried to produce everything locally across the entire product range — but no scale or depth sufficient to establish areas of competitive specialisation. One of the major benefits likely to flow from the new scheme is that it will create pressures for significant industry rationalisation.

Finally, the scheme has restricted market innovation. This has happened in two ways. First, the administration of the 1988 scheme meant that type approval for non-traditional product offerings or developments was seriously impeded because of the efforts to avoid technology bypass of the four IDA product categories. Second, the operation of the scheme created incentives for firms to extend product life cycles as long as possible, to maximise the return on investment. There has been little incentive or scope for reinvestment in next-generation product.

Real Industry Development

Telecommunications is one of the few sectors where Australia does have some real strengths. It also has some weaknesses. National industry policies should encourage the industry to build on its strengths.

Policies like the IDA scheme encourage industry to try to produce a bit of everything, but nothing well. In areas like telecommunications equipment we should focus on a few areas where it is possible to build competitive strengths.

The reality is that the future of this industry will depend on the investment decisions of a five or six main firms: A small group of multinational equipment manufacturers and AOTC, Australia's national carrier. The revised IDA scheme now acknowledges part of this reality, but we have still to put the equipment side into a wider industry perspective. Industry development must be designed to build strong international supplier and carrier relationships. Government needs to encourage strategic alliances between carriers and manufacturers, rather than clumsy effort to manipulate domestic procurement policies.

The fundamental reality to face is that successful industry strategies cannot be developed within a domestic, inward looking framework. Success will require the right combination of strategic investment attraction and enterprise incentives. Partial and ad hoc interventions like the IDA scheme are worse than no industry policy at all.

Dr Terry Cutler is the Managing Director of Cutler Consulting and is based in Melbourne. He was formerly Executive Director of Corporate Strategy for Telecom Australia.

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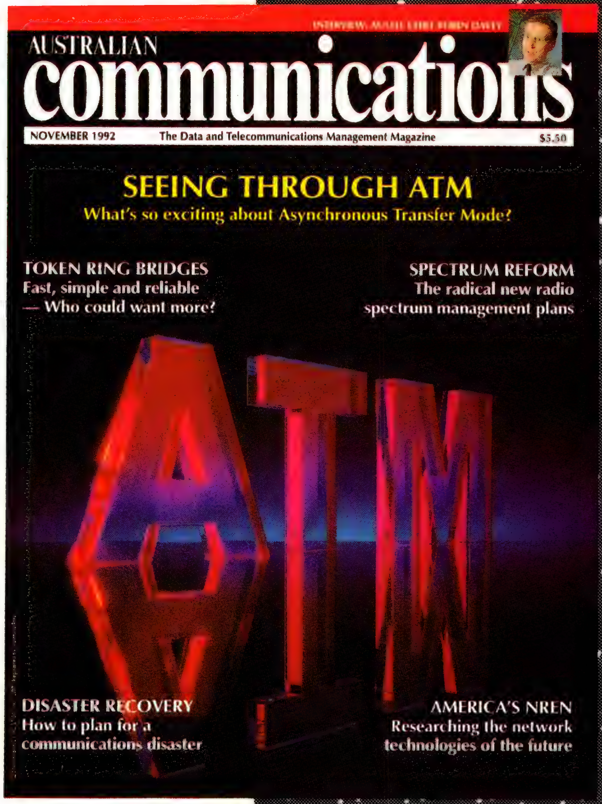

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Benchmarking — A Methodology

Brian White

Last month I introduced the topic of benchmarking as a method of improving communications management. This month I will go into more detail on the benchmarking methodology and in particular, the collection of data.

Let's recap on the principles behind benchmarking. Firstly, performance gaps in the delivery of communications services are demonstrated either by user requirements which are not met, or by objective measurements of performance which are clearly less than optimal. This can be caused by good staff doing the wrong things well or the right things badly. The quality of communications services provided to users can be improved only through improvement in the various functions and processes performed by the Communications Group. Benchmarking uses objective comparisons between internal performance and other organisations to identify symptoms, causes and solutions. In summary, benchmarking addresses:

- The symptoms = Performance gaps
- The causes = Sub-optimal processes
- The solutions = Best practices

Benchmarking is a realistic and tangible approach to continuous improvement because of its external focus. A Communications Group which focuses only on internal performance improvement may miss the fact that users can simplistically compare the quality and cost of their communications services with external alternatives. Benchmarking is the fairest and most objective way to compare internal performance with comparable external alternatives, with the ultimate purpose that change procedures are implemented to improve performance:cost ratios.

Benchmarking Categories

What is the best way to analyse the communications function to ensure effective benchmarking? The most useful alternatives are:

- *End User Services* — This divides communications according to the services as perceived by users, i.e. telephone, asynchronous data, mainframe terminal, LAN, mobile telephone, ACD, pager, messaging, etc.
- *Support Functions* — This divides the whole communications function into its component functions, i.e. planning, installing, operating, supporting and administering.

What do you compare with? The scope of each benchmarking comparison can be:

- *Internal* — Comparing two separate communications groups within the organisation (if more than one exists);
- *Industry* — Comparison with other comms groups in your industry or sector;
- *Size/scope* — Comparison with comms groups in other organisations with a similar number of users or geographical spread; and
- *Generic* — Comparison with the best practices used by communications groups generally

Benchmarking Methodology

The main steps in benchmarking are:

1. *Identify the key issues.* The prerequisite to effective benchmarking is to identify and document all processes and procedures within the communications support function, then prioritise which ones to go after. Further, every organisation has key issues, such as restructuring, efficiency drives, strategic initiatives, etc. Questions to ask include: Where is improvement needed? Where are most costs? What problems have been identified in the past? What issues determine user satisfaction?
2. *Establish existing performance.* Quantify the existing performance of the Communications Group in all aspects of the communications function, i.e. financial, technological and staffing issues. Comparison requires some form of baseline performance level between similar areas so that apples may be compared with apples. This step finds values for the benchmarking parameters and ratios.
3. *Gather external data.* The ideal method is to form benchmarking partnerships with similar organisations so that data may be shared. If this is not possible, an external benchmarking specialist with the necessary database and experience may be used.
4. *Analyse and compare data.* This step identifies the performance gaps. Ask 'why?' for each difference between your parameters and those of other organisations. You may find valid reasons why you are different from other organisations, otherwise some part

Information Sources

Information Source	Comment/Example
Internal Library	Industry & Competitive Information
Comms Group Documentation	Provides Most Information
Interviews	Key Individuals & Decision Makers
Surveys	User Intentions & Perceptions
Internal reports	Planning Documents, Reviews, etc
Internal publications	Internal Newsletters, etc
ATUG	Library Service, Peer to Peer Directory
Comms Industry Publications	*Australian Communications, Exchange, Interdata Telecommunications Handbook*, etc.
Independent Consultants	May Have An Extensive Database
Universities	Research Reports
Industry Data Firms	e.g. Multi-Client Studies
Seminars	e.g. ATUG Annual Conference
Peer groups	Data Shared By Cooperating Organisations
Suppliers	Carriers, Vendors, Service Providers

of the process needs to be fixed. Focus on the flow of activities across the functional areas rather than on the performance of any one staff member.

5. *Formulate the change process.* This requires involvement with staff to formulate the change processes. It is also important to make the benefits of change obvious to both staff and users.
6. *Implement change and continue to measure performance.* As the benchmarking process never stops, a culture of continual change and learning is required in the Communications Group.

Data Collection

The Table on page 101 lists most of the information sources available for communications benchmarking. Most internal data will come from your own Communications Group documentation, interviews and surveys. With regard to external information, possibly the most useful source is ATUG, either for its library service or to put you in contact with your peers.

A literature search is tedious, but can offer some benefits to the benchmarking process. As the purpose of communications technology is to assist the user in their day-to-day activities, it is useful to identify leading edge communications applications, as these may be relevant to improving user satisfaction or performance. A literature search such as this may uncover which industry players are openly discussing their use of communications and the use of innovative or best practices.

Questionnaires or surveys can be a very effective method of documenting user perceptions if they are done the right way. Check the following before sending out a survey.

- Have a clear purpose for the survey;
- Make it easy to answer, multiple choice, ticks, etc.;
- Minimise the need for guessing and estimating;
- Do not make the survey too long (e.g., under 15 minutes);
- Include the purpose and instructions for each question;
- Avoid ambiguity;
- Test the survey first on someone to see if it is effective;
- Make sure the right staff receive the survey; and
- Make it easy to return the survey.

Interviews of users can be used in a similar manner to surveys, in that they determine the perceptions and views of users and key decision makers. It should be remembered that users define quality and even the wrong impression in a user's mind is real and has a cause. The communications benchmarking process can use interviews to determine why users think the way they do.

Collecting source data for communications benchmarking can be difficult for the following reasons:

- There is far less public information compared with general financial benchmarking or DP benchmarking, which both get far more publicity and reporting.
- Many organisations do not have all the appropriate communications benchmarking numbers identified and documented (e.g. a minority of organisations would know their cost/p.a./phone).
- Change in the telecommunications industry in Australia (due to regulatory and technology change) has caused many communications benchmarking numbers to become out of date.

On the other hand, effective communications benchmarking requires only a handful of parameters and ratios in order to be useful.

Next month I will go into more detail on the benchmarking logistics and what to measure.

Brian White is a Senior Consultant at AAS Pty Ltd (Sydney) where he specialises in strategic planning, network engineering, benchmarking and communications management.

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Merging the Macintosh into Enterprise Nets

Product:	MacX.400 SD; TCP/IP Connection for Macintosh
Vendor:	Apple Computer Australia 16 Rodborough Road Frenchs Forest NSW 2086 Tel: (02) 452 8000 Fax: (02) 452 8160
Price:	Not yet available
Features:	MacX.400 lets Macs work in backbone messaging networks; TCP/IP Connection makes Macs members of TCP/IP nets.

For many years Apple Computer has been driving network managers crazy by offering only proprietary networking protocols for its computers. Some third-party solutions have come along, of course, but the frustration level remains high as more businesses turn to Macs as alternatives to PCs. Now Apple itself is offering two standards-based software packages that should go a long way toward integrating Macintosh computers into enterprise networks. The first packages ties the Macintosh into X.400 electronic-mail networks; the second makes it easier to connect and manage Macs in TCP/IP networks.

The e-mail software, called MacX.400 SD (Single Domain), enables a Mac user on an AppleTalk or Ethernet LAN to send messages to users on any X.400 network, regardless of platform. Apple Australia currently sells a Multi Domain version priced at $7,390 and says the Single Domain software will be available in the next few months.

MacX.400 SD turns a Macintosh into a dedicated X.400 server with a message transfer agent (MTA). The MTA furnishes store-and-forward switching and connects to MTAs on other X.400 servers, thus allowing messages to move from one network to another. This switching is accomplished because the MTA converts messages to the appropriate format for the destination network and determines where a file or message should be sent.

A MacX.400 application program interface (API), sold separately in a developer's tool kit, allows programmers to write user agents that handle protocol conversion and make the physical connection with other messaging systems, or with another e-mail server on the same network. The tool kit also enables developers to build e-mail gateways, and it furnishes X.400 services to applications like word processing packages.

By employing MTAs and client agents, MacX.400 SD can make connections to public X.400 networks or to private X.400 backbone networks. Connections to a public X.400 network require the MacX.400 SD software, MacX.25 software, and an Apple serial Nubus card for X.25 connectivity.

To operate in a private X.400 backbone setting, the MacX.400 SD server requires an Apple Ethernet Nubus card and an e-mail gateway, which can be purchased from another vendor or developed using the MacX.400 API. This combination allows X.400 messaging between users on AppleTalk networks or other networks like Ethernet LANs.

MacX.400 SD comes with a full OSI stack, allowing the network manager to tailor the software to the particular networking environment (see figure). For example, if MacX.400 SD is used on a LAN, the net manager can select the ISO Transport Class 4 protocol to exchange messages with Ethernet LANs. The Class 4 protocol provides error detection and recovery services.

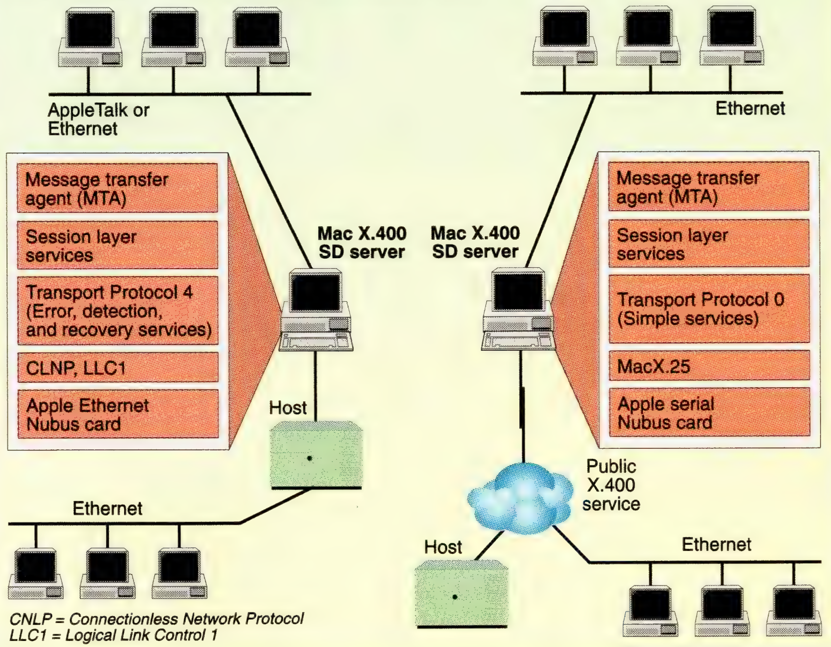
If the server connects to a public X.400 network, the network manager can choose the ISO Transport Class 0 protocol (which is more efficient than Class 4 but provides fewer services) for handling messages in an X.25 network. While the MacX.400 SD makes X.400 messaging easier, Apple's other new product simplifies the connection of Macintoshes to TCP/IP networking environments. The vendor's TCP/IP Connection for Macintosh supplies a TCP/IP protocol stack and runs on top of a software driver, called MacTCP driver, for network interface cards. The software and driver give users concurrent access to TCP/IP and AppleTalk services. For instance, a user can simultaneously log on to a TCP/IP-attached host and print documents on a Laserwriter printer using AppleTalk protocols. TCP/IP Connection for Macintosh provides SNMP management for Macs. The package includes SNMP agents and management information bases (MIBs) for the TCP/IP protocol stack (MacTCP stack) and will also be available in Australia in the next couple of months.

Apple also offers a tool kit, called TCP/IP Admin, that offers utilities for the central configuration and customisation of the TCP/IP Connection software with AppleTalk, Ethernet, or Token Ring networks.

Salvatore Salamone

A Choice of X.400 Connections

Apple MacX.400 SD enables a Macintosh to function as an X.400 server in a private network (left), or as a gateway to a public X.400 network (right).


AppleTalk or Ethernet
Ethernet
Message transfer agent (MTA)
Session layer services
Transport Protocol 4 (Error, detection, and recovery services)
CLNP, LLC1
Apple Ethernet Nubus card
Mac X.400 SD server
Mac X.400 SD server
Message transfer agent (MTA)
Session layer services
Transport Protocol 0 (Simple services)
MacX.25
Apple serial Nubus card
Host
Public X.400 service
Ethernet
Host
Ethernet
CNLP = Connectionless Network Protocol
LLC1 = Logical Link Control 1

NetComm's CardModem 24 conforms to PCMCIA 2.0

NetComm Maintains its Technology Edge

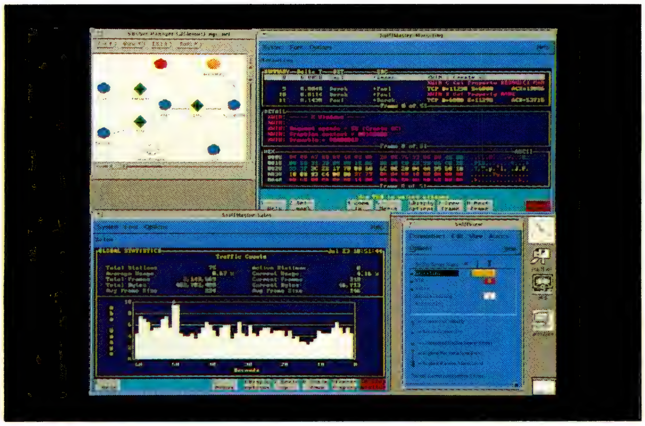
With a range of new and innovative product releases late last year, Australian modem manufacturer NetComm has once again demonstrated its determination and ability to maintain its place amongst the leaders of modem technology. The announcements include a new modem solution for the cellular telephone network; a new fax/modem for the Macintosh Duo System; enhancements to its SmartModem product line; and a credit card-sized modem for portable computers.

According to Paul Heath, NetComm's General Manager, Sales and Marketing, the new CardModem 24 is the first in a range of NetComm PCMCIA (Personal Computer Memory Card International Association) products. It provides connectivity for portable computers with PCMCIA 2.0 standard slots. A 2400bps V.24*bis* modem with support for V.42, MNP 2-4 error correction and MNP 5 data compression, the CardModem 24 requires no external power and features three power management modes to maximise battery life. Measuring 85mm x 55mm x 5mm, the product incorporates Autosoft communications software and includes a detachable line adaptor for connection to the PSTN. Available now, it is priced at $799.

NetComm's enhancements to its SmartModem product line flow from the introduction of a 16-bit Motorola processor to replace the 8-bit chip previously employed. The resultant increase in processing power has allowed NetComm to introduce more features including the combination of V.42 error correction and V.42*bis* data compression which makes it possible to achieve throughput of up to 57,600bps. The new model Smartmodem V.32*bis* M7F is priced at $1,599, while the new E7 and M4F models are priced at $1,399 and $1,099 respectively.

The Apple Macintosh Duo System consists of a portable computer and a desktop system with which it can be integrated. Scheduled for release in the first half of this year, NetComm's In FaxModem V.32*bis* for Macintosh Duo combines a V.32*bis* data modem with a V.27*ter* and V.29 Group III fax modem.

Rounding out the new product announcements, NetComm's SoftCel Modem Solution will provide cellular network subscribers with data connectivity. Developed with Australian company Intercel, SoftCel is made up of three components: A modem, SoftCel connection cable and software and a cellular phone cable. A typical configuration might include a NetComm Pocket Modem priced at $399, SoftCel cable and software priced at $229 and cellular phone cable priced from $69.



Network General's Sniffer is now available in an internetwork version

Internetwork Sniffer

The Expert Sniffer Internetwork Analyser, a new version of Network General's Sniffer network analyser has been released to tackle the fast-growing internetwork market.

Described by company officials as the first product to offer expert systems-based problem solving for router-based internetworks, the new product can view and analyse over 140 LAN protocols encapsulated within leased line (HDLC), frame relay and X.25 networks. It also provides internetwork bandwidth utilisation statistics and handle data rates of up to 2.048Mbps.

The product also addresses the host-terminal market with the incorporation of LM2000 software which handles a variety of protocols such as async, bisync, frame relay, X.25 and SNA. The software also features BERT testing and test libraries.

In addition to the new Expert Sniffer Internetwork Analyser, Network General has also released SniffMaster for X (SM/X) — a system which will allow managers of Unix-based networks to access Sniffer servers on remote segments. It can be accessed from Sun workstations, X-Window based workstations running SunNet Manager, HP OpenView, IBM NetView/6000, Cabletron's Spectrum and X-terminals.

Network General Australia (02) 967 2121

Print Server

Com Tech Communications recently expanded its LAN printer connectivity offerings with the introduction of Xircom's Pocket Ethernet Print Server which officials say allows parallel printers to be located anywhere on the network.

Supporting a range of printers and plotters, along with PostScript and PCL languages, the product includes flash memory which allows for software upgrades and product enhancements. It is available for either thin Ethernet or twisted pair Ethernet connections and supports Novell NetWare 2.x and 3.x network operating systems. Also featuring support for multiple servers and print queues, diagnostic LEDs for troubleshooting, and encrypted passwords for network security, the new Pocket Ethernet Print Server is priced at $895.

Com Tech (02) 317 3088

Token Ring Migration

A brand new range of Token Ring products has been developed by SynOptics to ease migration from IBM/SNA environments to LAN-based systems.

Comprising new workgroup hubs, host modules, a standalone bridge and Release 2.0 of Lattis EZ-View network management software, the new offerings are said to offer flexible bridging for Token Ring environments and simplified Token Ring hub management for Novell NetWare environments.

The new host modules — the 3502B and 3505B — are designed for the company's System 3000 intelligent hub and feature frequency error detection to prevent beaconing conditions. They are priced at $2,970 and $4,116 respectively. The new 2712 and 2702-C workgroup hubs are stackable, offer 16 ports for shielded and data grade unshielded twisted pair cabling, and are priced at $7,788 and $4,116 respectively. The new 2722 standalone bridge enables internetworking of Token Ring environments. It is priced at $17,202.

The new Release 2.0 of Lattis EZ-View network management software extends the application's management capabilities to Token Ring environments and also adds SNMP over IPX protocol support. It is priced at $1,215 per licence, with upgrades for current users available at $265.

SynOptics Communications (03) 853 0799

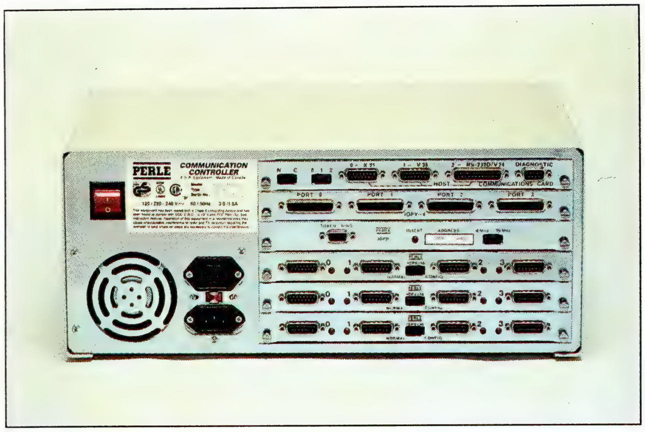
IBM Mid-Range Connectivity

IBM compatible equipment supplier Perle Systems has released a new range of remote communications controllers for IBM mid-range systems.

The new Perle 494 controller family is designed for managers who view IBM's 5494 environment as strategic but who require extra functionality such as expanded device support and increased LAN capabilities, company officials said. Available in two models — the 494-R1 and 494-R2 — the products can be configured to provide SDLC or X.25-to-host connectivity for up to 28 twinax and 40 Token Ring devices; Token Ring-only connectivity for up to 40 PCs; or twinax connectivity to a Token Ring attached host.

The Perle 494-R1 initially supports up to 28 twinax devices and can integrate into networks employing Perle 394 or IBM 5394 controllers with no host operating system changes. Officials say it is ideal for users with current twinax requirements and Token Ring integration plans.

The new 494-R2 is designed for users requiring both remote Token Ring and twinax connectivity. It links up to 28 twinax and 40 Token Ring devices.



Perle's new 494 family can support up to 68 devices

Perle has also announced the release of XGATE, its X.25-based PC-host access system. The product allows PC users to access an IBM mid-range system from an X.25 network.

Perle Systems (02) 416 0650

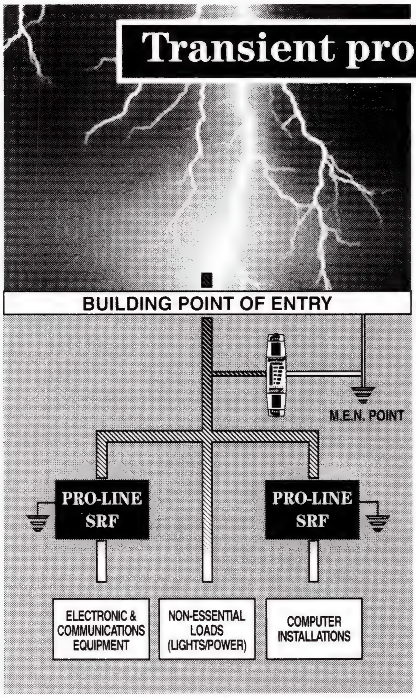
Terminal Server

Cabletron recently released new software for its Ethernet Terminal Server Media Interface Module (ETSMIM) which adds TN3270 support and extends the product's functionality and flexibility in areas of connectivity, security and statistics.

TN3270 support extends the attributes of ETSMIM to include blink, reverse video, underline and print screen key and enables VT100 series terminals to emulate IBM 3278 terminals.

The new Version 4.0 software also adds features such as network scripts, dialback cap-

Transient protection for hardwired power installations



A direct lightning strike can have peak currents approaching 150,000 Amperes. Modern computing and communications installations are highly susceptible to these impulses if coupled onto mains reticulation systems.

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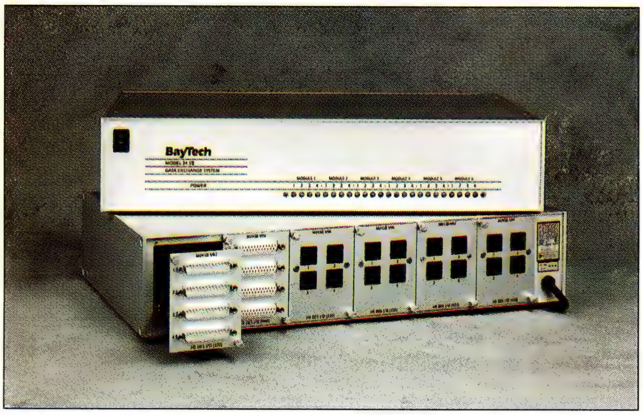

The Baytech 24S11 can support up to 24 ports

abilities, accounting, SNMP improvements, and also improved rotary support and domain name server to the ETSMIM.

The scripts feature allows execution of pre-defined script files, either at login or in response to a user entered command. This allows the setting up of an entire ETSMIM with a single command according to company officials.

The dialback feature is used as a security device whereby users who have dialled in with a modem will be called back at a pre-defined telephone number, thus reducing the risk of break-ins to the systems. With the new accounting feature server managers can oversee connections to network services and track service use and network utilisation. The new built-in domain name server equates machine names with IP addresses, thus reducing the workload of host machines.

The improved rotary support offered by the Version 4.0 software enables the allocation of an IP address to one port on the ETSMIM or the assignment of a series of IP addresses to a group of ports.

Cabletron (02) 878 5777

Data Exchange

Comm-Way recently announced the release of a data exchange system and parallel/serial converters from BayTech.

Company officials claim the new 24S11 Data Exchange System provides 5.5Mbps throughput speed with up to 46,000cps serial communication, and up to 60,000cps parallel communication. In addition, a 16M dynamically-allocated buffer enables full duplex communications at 115.2Kbps for high speed file transfer and peripheral sharing.

The product has a modular interface design and is configurable via an on-screen menu on a host port or any serial computer port. It is also expandable from four to 24 ports. A key feature according to company officials is its ability to provide device selection while in Windows or graphic programs.

Also released, Tran-X, a parallel/serial converter connects to a PC parallel port, providing data transfer at rates from 300 to 460,000bps.

Comm-Way (03) 331 1700

IP Router

ADE Network Technology has released a new router for the interconnection of remote LAN segments over telecommunications lines.

The new LANB/290 provides both IP and bridged filter capabilities. Its bridging function allows the router to pass through non-IP packets to a central site, thereby enabling it to handle other transport protocols. Conforming to PPP specifications over serial links, the bridging function can be en-

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MULTIPLEXERS
Will they replace bridges and routers?
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The Commander D72 is designed for up to 50 users

abled and disabled using SNMP MIBs or the console port on the device. The product also supports bridge statistics and, with a dedicated console port, can be configured and controlled from an ASCII terminal or modem.

Priced at $5,247, the LANB/290 is packaged in a double-height, standalone enclosure and with its own power supply. Each unit provides one LAN connection and one data link interface and is now available with an RS-232, RS449/422, V.35, X.21 or G.703 link interface.

ADE Network Technology
(03) 543 2677

New Commander

The latest Commander key telephone system has been designed to offer small businesses access to new generation network technologies such as ISDN.

The new Commander D72 system is based on Telecom's D128 telephone system but is designed primarily for between 10 and 50 users. It will support up to 40 lines or 30 ISDN Macrolink channels and 64 extensions in any combination up to a maximum of 72.

The system has a modular design and a range of programming options which enable flexible configuration and updating. In addition, applications such as voice mail are available for improved call handling.

Telecom Technologies
(03) 818 3888

LAN Virus Software

Central Point Software has developed Central Point Anti-Virus for NetWare which provides flexible virus protection for NetWare 3.11 networks.

The new product comprises a server protection NLM which provides real-time scanning of all files as they are sent to and retrieved from the server; a master NLM which enables multiple, linked servers to communicate virus information; desktop protection packages including Central Point Anti-Virus for Macintosh, and Central Point Anti-Virus for DOS; and a centralised administration program.

The product is compatible with desktop systems protected by the company's other anti-virus products through a technology called CentralTalk. According to company officials, this technology enables desktop PCs and fileservers to transparently communicate virus information from anywhere on the network.

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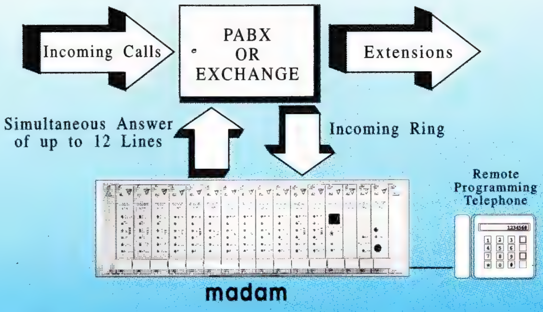
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The new anti-virus product is priced at $1,755, and includes a single-server licence and a five-user licence for any mix of Central Point Anti-Virus for DOS and Central Point Anti-Virus for Macintosh.

Central Point Software
(02) 719 8941

Ethernet Bridge

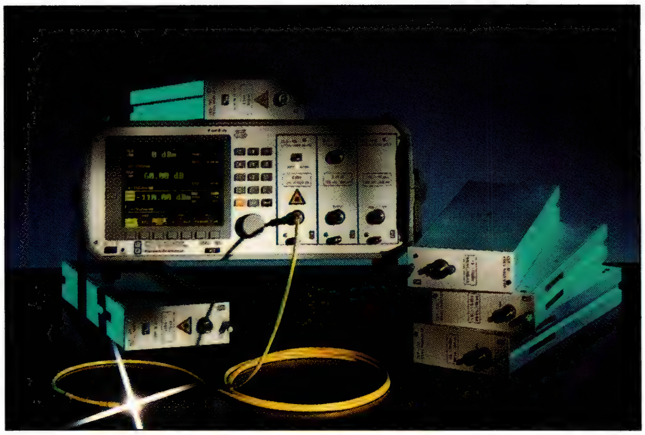
The Micom NetRunner from Datacraft is a remote Ethernet bridge which transmits voice, fax and LAN traffic over the same DDS/DDN/MDS/ISDN link, company officials say.

Utilising Rapid Relay technology — a combination of fast packet multiplexing, fax demodulation and advanced voice and data compression — the new bridge squeezes voice and data traffic, along with bridged LAN traffic over leased lines.

Referred to as a Data/Voice Internetwork Node, NetRunner is available in two models — the NetRunner 100E which accommodates up to four voice/fax channels and one synchronous channel, or up to five asynchronous data channels; and the NetRunner 500E, which accommodates up to six voice/fax channels and up to five synchronous or asynchronous data channels. In addition, up to 41 data connections may be integrated with LAN/WAN traffic.

Supporting all LAN protocols including TCP/IP, DECnet and Novell IPX, the new bridge can interconnect remote Ethernet LANs using 9.6Kbps to 64-Kbps leased lines and achieves more than 10-to-1 bandwidth efficiency over local area networks, officials claim.

According to company officials, the product doesn't need manual address configuration. It can also be monitored and configured through a terminal connected to the unit or from any Telnet or LAT workstation on the LAN. In addition, removable Featurepak cartridges enables upgrading of the NetRunner operating software.



Wandel & Goltermann's OMS-100 features a large graphics display

Other features of the new Micom-supplied NetRunner Ethernet bridge product include a dual 32-bit processor bridge engine, WAN link speeds up to 64Kbps, 10,000 pps filtering rate, optimised data compression of LAN packets, IEEE standard Spanning Tree Protocol, manageability from WAN or LAN, and an SNMP network management agent.

Datacraft (03) 727 9111

Fibre Optic Testing

A new generation of fibre optics test equipment has been released by Wandel & Goltermann to perform basic measurements required in research and development and maintenance of fibre optics equipment.

The new OMS-100 features a large graphics display and serial IEEE interface, and accepts

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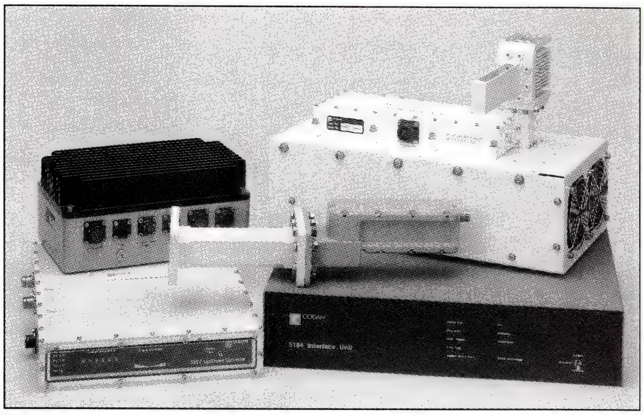
up to three plug-in test modules simultaneously. Various level meter modules with high linearity and a dynamic range of over 120 dB are available for precision measurement of level and attenuation.

New features of the product include wavelength selectable level measurements at 1310 and 1550 nm, and also simultaneous measurement and display of the level at two wavelengths. The product also offers 0.005 stability, a calibrated 0 dBm output power level, and reflection attenuation of 40 dB.

According to company officials, the components of the OMS-100 are easily configured into a multi-channel level meter or setups for measurement of attenuation or linearity, and the system is able to handle applications which previously required various single instruments.

Wandel & Goltermann
(03) 690 6700



Codan's C-Band transceiver is suitable for remote locations

C-Band Transceiver

Leading communications equipment manufacturer Codan has released a new C-Band satellite transceiver designed for integrators of C-Band earth stations in rural and remote areas.

Offered as either a complete system or in individual component form, the new Codan transceiver comprises a 70 MHz indoor interface unit, an outdoor mounting, an up/down converter and power supply modules, LNA/TRF combination, a 10 or 20 watt add-on SSPA assembly, interconnecting cable set and dry air system.

According to company officials, the product offers excellent intermodulation performance, low power consumption and high speed SSPA activation and is suitable for multi-carrier applications and remote solar powered sites — particularly if remote signal activation can be used, company officials say.

Codan (02) 971 2233

NetWare X.400

Retix and Novell recently joined forces to develop a brand new X.400 NLM for the NetWare Global Messaging (NGM) environment. The new Retix X.400 for NetWare Global Messaging works directly with the Novell X.400 Protocol Access Module to deliver X.400 capabilities to NetWare users who are either upgrading to NGM and want X.25 WAN access to X.400 services, or are already using NGM and want to use X.400 to interoperate with platforms outside their local LAN over 802.X.

Offering access to public e-mail services or message platforms, the product comprises the X.400 NLM from Retix, including a customised version of the Retix X.400 libraries; Novell's X.400 Protocol Access Module which includes Novell LAN/WAN transports and utilities; and an NGM-integrated X.400 administration utility.

Retix (03) 629 2595

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Data Security

Melbourne-based computer security specialist Martlet Software has developed the CustomLoc Smart Security System which provides access control and data security for PCs, notebooks, workstations and networks.

The new system is based around a hand held smartcard unit which attaches to the serial port of a PC. According to company officials, it can encrypt the full hard disk on a workstation or PC to ensure protection of files and passwords. Its features include individually tailored access rights, multi-level user identification and authentication, user and item logging, file locking on the hard disk at the directory, sub-directory and file levels and 4 to 16 character, updatable passwords.

CustomLoc operates around a unique smartcard unit

In addition, password and encryption files are not held in data files on the network, according to officials.

CustomLoc can also provide virus protection by encrypting all files in the boot sector and system areas of the PC.

Priced at $395, CustomLoc provides security to the level required by national privacy legislation and was designed to meet the joint standards for PC security systems and data encryption as required by the governments of Australia, France, Germany, Holland and the UK. The unit can also accept ISO-compliant EEPROM smartcards.

Martlet Software
(03) 882 3246

LAN/WAN Analysers

Local and wide are network test equipment specialist, Tekelec, has announced the addition of a new Token Ring analyser to its ChameLAN 100 range of LAN analysers.

The company's new ChameLAN 100 Token Ring Release 1.0 analyser supports simultaneous analysis of multiple Token Ring local area networks and like Tekelec's FDDI and Ethernet analysers, the new product is based on an Intel 80389 33MHz processor.

According to company officials, the product is able to concurrently correlate (to an accuracy of 10 microseconds) and time stamp frames transiting on FDDI, Ethernet and Token Ring LANs. As a consequence, network managers can now examine traffic on both sides of a router or bridge simultaneously, company officials claimed.

The analyser can arrange for data to be filtered, captured, or viewed in real time on each individual test interface. In addition, test of multiple LAN interfaces can be performed simultaneously on a mixed topology network.

The Token Ring hardware interface features an on-board processor, and displays data in both graphic and tabular formats. Real-time data may be captured to a 4 or 20M buffer, or saved to a 120M or optional 200M hard disk.

The ChameLAN 100 family is based on an X-Window System, MOTIF and colour graphical user interface which features icons and pop-up windows.

Tekelec has also recently announced an Ethernet option for the Chameleon 1800 WAN analyser. The option enables Chameleon 1800 users to monitor real-time data unobtrusively at 10Mbps and without affecting network activity.

Company officials say that data can be displayed in tabular or graphical formats.

Tekelec (02) 790 2200

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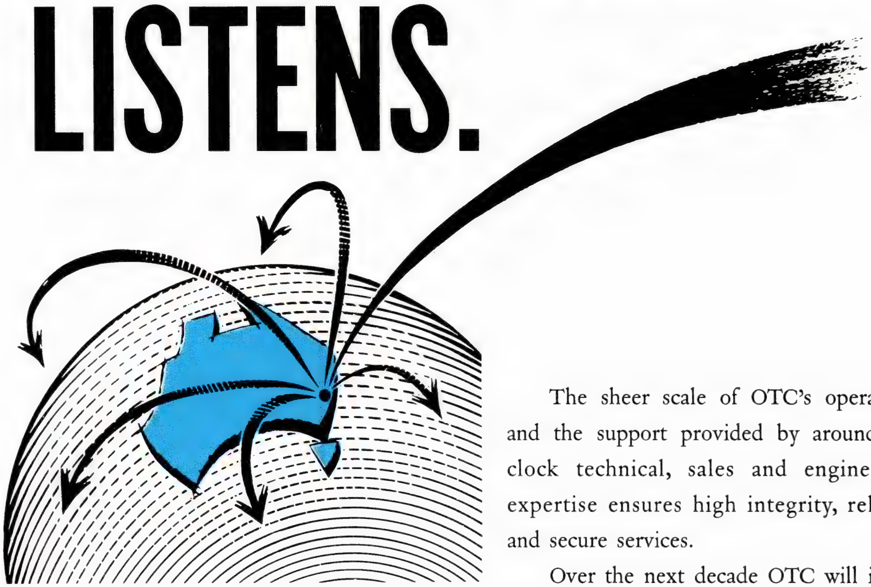

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Today, OTC is one of the world's most advanced and experienced communications companies, having aided many nations across the Asia Pacific region in establishing their world-class communications system.

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What We Talk About When We Talk About Deregulation

Within the Pacific Telecommunications Council (PTC), it is a tradition to hold a special seminar each October focusing on telecommunications issues within a specific region — and bringing those regional concerns into a global perspective. With that in mind, PTC hosted a two-day seminar last October in Auckland. Readers of *Australian Communications* will be especially aware of New Zealand's nearly total telecoms deregulation and liberalisation. For some time now, New Zealand has been viewed worldwide as a deregulation laboratory. The sheer scale of change within New Zealand as a result of deregulation — and not just within telecommunications — makes the movements in other countries appear quite stodgy and minimal in comparison.

Our two-day seminar, like most PTC meetings, provided a uniquely in-depth look at the New Zealand scene. Among the key speakers were the Minister of Communications, Maurice Williamson, and his Labour shadow minister, Steve Maharey. As New Zealand's telecoms deregulation was launched by the Labour Government, was there anything for Mr Maharey to criticise? To the extent that New Zealand's new telecoms environment appears to be genuinely popular, Mr Maharey may be correct in surmising that deregulation was "the right move." But, he goes on to say, "the current National Government misunderstands what deregulation means. There seems to be a belief that deregulation begins and ends with the opening up of traditionally public sector areas of activity to the private market . . . Any talk of intervening in the market results in a barrage of criticism about a return to old-style regulation . . . This is dangerous nonsense that would be laughed at in Asia and the more successful European economies." (The entirety of the debate between Mr Maharey and the Minister is found in the latest *Pacific Telecommunications Review*, available from the PTC office in Honolulu — fax: +1 808 944 4874.)

"Few countries will emerge from the current recession without significant structural change to their telecoms and nascent multimedia industries."

Mr Maharey advocates a type of 're-regulation,' or 'light handed regime,' or 'strategic partnership' between government and industry. Such an approach is increasingly popular as the 1990s progress. This school of thought, reaffirmed by the election of Mr Clinton in the US and by regulatory developments in the US, Australia, Canada, and elsewhere, places telecommunications as the key strategic resource in a country's overall industrial strategy. Increasingly, ideological solutions — whether of the right or the left — are out of favour as they are seen to leave out the human and societal foundations of why governments govern and how business behaves.

I found it significant that the Minister, Mr Williamson, arrived at the PTC meeting wearing and pointing out, his Adam Smith tie. I was reminded of the 1981-82 Law of the Sea negotiations, when the US delegation, newly-appointed by the recently-elected President Reagan, arrived similarly attired, declaring on their chests, as it were, their intention to scuttle the negotiations. The writings of Adam Smith were often cited in the Roaring 80s as an affirmation of the free market faith, and of promoting the utter liberalisation of industry. Yet, a close reading of *The Wealth of Nations* will in fact reveal that Smith clearly understood the need for overall strategic, social, cultural, security, and national objectives to be considered in the world of industry and commerce. Smith saw that relatively unfettered commerce and the freedom of nations to trade would fuel national wealth and strength. Smith was no ideologue, but his philosophical writings were harnessed to reinforce the ideology of deregulation.

This of course, was the foundation of Reaganomics, Thatcherism, and New Zealand's own Labour Party 'Rogernomics.' Yet only in New Zealand did real telecoms 'deregulation' occur. In the US, the AT&T divestiture spawned several large monopolies — the RBOCs — while deregulation of the cable TV industry led to the rapid rise of a powerful oligopoly enjoying monopoly service-provision rights. A vast array of protectionist legislation remained in place, as did complete restrictions on cable-telecoms cross-ownership.

In Britain, deregulation led to a sort of duopoly, wherein BT still enjoys over 90% of the British telecoms market. In some areas competition has emerged, most notably in the US long-distance market and in new applications (enhanced services, cellular, etc.). Except in New Zealand, 'deregulation' has almost everywhere meant 'different regulations,' or 'slight liberalisation,' or a 'transition to oligopoly.' Throughout the 1980s, hype outperformed reality.

Ironically, the grey, realistic 1990s may well yield a far greater level of genuine deregulation. This 'real' deregulation will not be ideology-driven, as it was in the 80s, but will follow the natural development of new technologies. The explosion of cellular technology, satellite systems, media convergence, PCN, fibre optic technology, and the array of applications for each of these will make the retention of monopolies a physical impossibility. Moreover, a new era of competitive multimedia systems will render all existing telecoms regulation virtually extinct. This was one reason why, for example, it was seen as vitally important for Canada's new telecoms legislation to be 'technology neutral' — yet the mere existence of separate telecoms and broadcast legislation shows such legislation to be obsolete from day one.

The ability to look at the telecoms marketplace without ideological blinkers may in fact lead to the greatest levels of deregulation and liberalisation. Governments in the 1990s must look at stark solutions to restoring national well-being. Few countries will emerge from the current recession without significant structural change to their telecoms and nascent multimedia industries. New communications technologies make competition inevitable from local basic service, to cellular mobile, to international telecoms, to broadcasting content via multimedia systems. This is the challenge of convergence, and it is a challenge governments will be forced to confront — if they wish to retain any sovereign role at all or ensure the fulfillment of public policy goals.

What we talk about when we talk about deregulation has changed in the last few years. We now talk about convergence, multimedia, strategic technology policy, electronic highways, and telecoms as infrastructure. We also talk about the global nature of telecoms, and its innate internationalism. Ideology is no longer a factor — even the strongest PTT pays lip-service to competition — and regulation is seen as having an important role in preventing chaos as the information age emerges.

James Savage is the Assistant Director, Pacific Telecommunications Council and Editor of Pacific Telecommunications Review.

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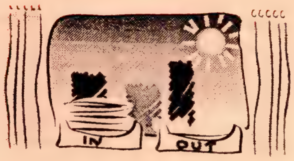


From the desk of the Executive Director

ATUG '93 — Competition in Action

In this issue, the ATUG pages highlight ATUG '93, the annual convention for the telecommunications industry and the brochure and registration forms are included as an insert. Each year, the importance of telecommunications to our conduct of business seems to grow. Telecommunications provide new ways of doing things, new opportunities to become more efficient and, in an emerging competitive environment, new openings to exploit the freedom to provide or resell any telecommunications service to anybody else.

Evidence is now clear that competition is also bringing about lower, more cost-related prices, better quality of service and, at last, concentration on the needs of the carriers' customers.

Action or Inaction?

Competition in Action is the theme of ATUG '93 and for those who would like to suggest that might be two words, not three, they should simply look at the evidence. Optus has now opened both its Melbourne and Sydney switching centres, entered the long distance telephone market and has gathered cellular mobile customers at an astonishing rate.

The effect on AOTC's roll out of services and 'delighting' of its customers has been equally remarkable. And the Government, for its part, has selected the third mobile carrier, Arena, while the Opposition has exercised our minds about the implications of a privatised AOTC. Austel too, continues to develop new areas of study, such as our new national numbering plan, privacy issues, rural and remote services and pre-selection to name a few.

Keeping Up with the Action

Sure, there is continuing action. Keeping up with it is the main problem for those who deal in telecommunications from day-to-day and for those who are finding that telecommunications is impacting more and more on their business thinking. That's what ATUG '93 is for — keeping up with the action in technology, services, in equipment and with the people who are involved in the action.

New Streams

Although we have stayed with a successful format of a three day Conference and Exhibition preceded by a one day update seminar, we have added two significant streams. Together with the Small Enterprise Telecommunications Centre (SETEL) we are providing, in parallel with the Update Seminar, a Small Business Telecommunications Seminar, designed specifically for those smaller organisations that do not have the expertise to understand how they might exploit the new opportunities of competition.

ATUG has long pressed for the need for very senior management to comprehend fully the importance of telecommunications on business efficiency and business bottom lines. This year we are doing something about it and those Communications Managers who have a problem getting these points across to Chief Executives might care to bring this stream to their notice.

The Executive Seminar will be one of the afternoon streams on the Opening Day of the Conference, 11 May. It is designed specifically for Chief Executives and personal invitations will be sent to those people. Combined with the important presentations in the morning, or even only attended in the afternoon, this stream should provide executives, including those with little or no telecommunications expertise, with a sound comprehension of the technology, services and opportunities available.

Opening and Keynote Not to be Missed

The Minister for Communications of the new government, whichever party gets up, will open the Conference and we should receive a good insight into the future under that government. Privatisation, stimulation of competition and industry development are likely to figure prominently in that address.

The Keynote Address, to be delivered by Jim McKerlie of Deloitte Ross Tohmatsu, promises to be both interesting and thought provoking. It will be along the lines of a recent presentation by his American colleague Joe Kramer, who gave a fascinating view of the difficulties faced by monopoly carriers in adapting to competition. Mr McKerlie co-authored that presentation and will turn it around to look at the way users are adapting and how a competitive market demands a much more intelligent approach by users than in a monopoly situation.

Lectures and Workshops

The very full conference program covers the gamut of technologies and issues in telecommunications today. We have expanded the workshops considerably in response to demand, so delegates have the option of sitting and listening or taking a more active part in the learning process.

The final session on Thursday afternoon will, as always, be different and stimulating. We are presently planning that it should address the relatively hot issue of pre-selection but plans are not yet final.

Conference is About People

Probably the most important and satisfying aspect of the ATUG conventions is the interaction of the people, both socially and professionally. Everyone in telecommunications will be there. Come and meet them. Talk over with them your ideas or your problems. And our sponsors will entertain you at the Optus dinner, AOTC cocktail party and Fujitsu lunch. Communications people should be at Darling Harbour, at Sydney in mid-May to enjoy and learn from ATUG '93.

Wally Rothwell
Executive Director

ATUG AUSTRALIAN TELECOMMUNICATIONS USERS GROUP

ATUG '93 Special

This year, ATUG celebrates its 10th Australian Telecommunications Exhibition and Conference, ATUG '93, with the introduction of two new features: 'The Executive Seminar' and 'The Small Business Seminar.' Both seminars have been designed to cater for the special needs of these two distinct telecommunications user groups.

As always, the annual ATUG convention includes seminars, workshops and exhibitions as well as the 'Communications Update' seminar which precedes the convention's seminars. The Update Seminar will be held first on Monday, 10th May, 1993. The main themes to be discussed are:

- The changing environment;
- Regulations and standards; and
- Competition in action.

Other very important topics to be covered at ATUG '93 include:

- The growing telecommunications export market;
- Multimedia;
- Standards;
- EDI;
- Research and development;
- Security;
- Satellites; and
- New generation public switches.

Keynote speakers include Austel Chairman, Robin Davey; AOTC Chief Executive Officer, Frank Blount and Optus Chief Executive Officer, Bob Mansfield.

Finally, it is anticipated that the convention will close with a debate titled 'The Battle of the Carriers' which will be recorded for a television audience. Registration forms will be available soon. ATUG '93 will be held at Sydney's Darling Harbour from May 10 to May 13, 1993. Further details regarding 'The Small Business Seminar' will made available in the next issue.

ATUG '93

Communications Update Seminar — Monday, 10 May 1993

0900	**REGISTRATION**	
0930	**OPENING ADDRESS** The Davidson Report — A Ten Year Perspective	Jim Davidson
1015	**KEYNOTE ADDRESS** Computercations — The World of Convergence	Details to be announced
1100	**MORNING BREAK**	
1130	**THE CHANGING ENVIRONMENT** The Telecommunications Industry Ombudsman	Details to be announced
1200	The Telecommunications Industry Development Authority (TIDA)	Bob Lansdowne
1230	The Major Resellers Market	Barry Wheeler
1300	**LUNCH BREAK**	
1430	**REGULATIONS AND STANDARDS** Austel — The Regulatory Year In Review	Johanna Plante
1450	Telecommunications Standards — Benefits and Opportunities	Allan Horsley
1510	Oh What A Tangled Web We Weave — Communications and The Law, A Review	Peter Leonard
1530	**AFTERNOON BREAK**	
1600	**COMPETITION IN ACTION** AOTC: The Realities Of Competition	Steve Burdon
1630	Optus: Products and Markets 1993-94	Ian Boatman
1700	Are We Doing It Right?	Stewart Fist
1730	**CLOSE**	

ATUG '93 CONFERENCE

Day 1 Tuesday, 11 May 1993

0800	**REGISTRATION**			
0930	**OPENING ADDRESS** Minister for Transport and Communications			
1000	**KEYNOTE ADDRESS** Competition in Action — Jim McKerlie, Deloitte Ross Tohmatsu, Australia			
1030	**MORNING BREAK**			
1100	**ATUG CHAIRMAN'S ADDRESS** George Maltby			
1120	**KEYNOTE ADDRESS** Major Business and Telecommunications — A Perspective: Jim Smith, CEO, SEC (V)			
1155	**KEYNOTE SPEAKER** CEO, Arena GSM			
1230	**LUNCH BREAK**			
	STREAM 1 The Telecommunications Export Markets	***STREAM 2 Multimedia — Coming Ready Or Not!***	***WORKSHOP 1***	***WORKSHOP 2***
1400	**Where Are The Markets — An Analysis** David Faulks, Austrade	**Multimedia and Telecommunications.** David Strong, Apple Australia	**Communications Management: Best Practice** Brian White/David Swift, Amos Aked Swift	**EDI for the SMALL to MEDIUM size Businesses** Steve Shepherd, GE Information Services
1430	**AOTCI and the International Market** Peter Shore, AOTC	**Multimedia and the Visual Information World** Les Free		
1500	**A Manufacturer's View** Graham Darley, Stanilite	**Multimedia and Network Protocols** Ross Halgren, AWA Defence		
1530	**AFTERNOON BREAK**			
	STREAM 1 The Standards Push	***STREAM 2 The Noose of Light — Fibre And Its Impacts***	***Stream 3 News In Wireless Networks***	***WORKSHOP 3***
1600	**Austel — A Legal Review** To be provided	**Fibre Technology — Present And Future** Ron Spithill, Alcatel	**Advances In Cordless Office Communications** Stuart Palmer, GPT	**Telecommunications Power — Clean Up Your Act!** Mike Snowdon, Commonwealth Bank
1630	**Austel — A Standards Review** To be provided	**Applications: The SEC CBD Project** Sydney Electricity	**Whence DECT?** Ericsson, to be provided	
1700	**Austel — A Technical Review** To be provided	**Whence The Copper-pair?** AT&T USA, to be provided	**Spread Spectrum — Underpinning The New Wireless World** Jim O'Mura, 'Cylink'	
1730	**CLOSE**			

Executive Seminar — Tuesday Afternoon, 11 May 1993

1430 to 1440	**An Executive Introduction to Australian Telecommunications** An Overview of Government Policy; the Carriers; Resellers; Regulation — particularly Austel and Ombudsman; and the Communications Industry	George Maltby
1440 to 1510	**Communications and Corporate Health — An International Perspective** How Must Top Management View and Address the Relationship Between Communications and Corporate Health, Growth, and Competitive Edge	Warren Falconer (AT&T, USA)
1510 to 1540	**Clever Management In The Clever Country** An Experienced Executive & Academic Discusses The Need For A Heightened Executive Understanding of the Role of Telecomms in a Successful Enterprise	Tony Newstead (Monash University)
	AFTERNOON BREAK	
1610 to 1640	**Financial Aspects of Corporate Communications** Analysing Communications Investment; Monitoring Facilities and Service Effectiveness; Cost Control, Analysis, and Reporting'	Rosemary Sinclair (ABC)
1640 to 1710	**Enterprise Communications — The Human Element** Managing the Telecommunications/IT Relationship; 'Insourcing' and 'Outsourcing' — Benefits and Losses; The Role of Professional Consultancy — Why, When and How; Executive/IT Management Relations	Alan Aked (Amos Aked Swift)
1710 to 1720	**Tying It All Together** Encouraging Increased Executive Involvement and Heightened Interest in the Power of Communications; The Dangers of Neglect	George Maltby
1720 to 1730	**ATUG: Business Advocate and Major Influencer of Change** ATUG's Role; Major Initiatives and 'Wins,' etc.	Wally Rothwell
	POST-SEMINAR DRINKS	

Day 2 — Wednesday, 12 May 1993

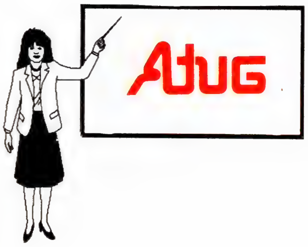
0900	**EXECUTIVE KEYNOTE ADDRESS** Robin Davey, Austel			
0930	**In The Red Corner** Frank Blount, AOTC			
1000	**In The Blue Corner** Bob Mansfield, Optus			
1030	**MORNING BREAK**			
	STREAM 1 ***The Borderless Information World***	***STREAM 2*** ***Penny For An Acronym: All About FR, ATM and FDDI***	***STREAM 3*** ***Aspects of Voice Processing and the PABX***	***WORKSHOP 4***
1100	**The Coming Battle in International Connect** Seth Blumenfeld, MCI	**View From the Forum, Frame Relay** Alan Taffel, Interlink	**The PABX Audit — A New Concept** Anita Gracie, AFP	Austel Design Guide — A Tutorial Robin Bray, Vistel
1130	**NZ: Competition Without A Referee: Pros and Cons** Neil Tuckwell, Clear Communications	**Frame Relay and Voice** Mike Terry, A.C.T.	**The Corporate Directory — Cinderella of PABX Management** Myles Hampton-Chubb	
1200	**Themes, Trends and Future Perspectives** Ericsson, to be provided	**ATM-v-FDDI: What's It All About?** Nick Jackson, 3Com	**Integrated Voice Processors — Present and Future** Tony Hayman, Telsis	

1230	**LUNCH BREAK**			
	STREAM 1 ***Data Networking***	***STREAM 2*** ***'GSM Heats Up'***	***WORKSHOP 5***	***WORKSHOP 6***
1400	**EDI — Slumbering Giant** David Mackay, CIRCIT	**The Telecom Trials** Kevin Phillips, AOTC	**The Future of the Modem** Netcomm	**Structured Cabling Systems and Their Administration** Roger Fairbairn, AT&T
1430	**E-Mail and X.400 New International Markets** Ian Heard-Jardine, Infonet	**The Right Choice?** To Be Advised		
1500	**LAN Internetworking and Management** Steven Moustakas, SynOptics	**International Experience** Nokia, to be confirmed		
1530	**AFTERNOON BREAK**			
	STREAM 1 ***The Private Network Scene***	***STREAM 2*** ***New Generation Public Switches***	***WORKSHOP 7***	***WORKSHOP 8***
1600	**University of Sth Australia** Don McKellar, Consultel	**AXE — Switch For All Seasons** Ericsson, to be provided	**Competition and Convergence** Brian Lee, Sun Micro Systems	**Doing Information Technology Business in the Peoples Republic of China** Gerald Wakefield/ Alan Collier, Sly & Weigall
1630	**The NSW Government Network** BT, to be provided	**DMS100** Alex Krawchuk, NorTel		
1700	**AARNET** Dr Beale, University of NSW	**The Future of Public Switching** Fujitsu, to be provided		
1730	**CLOSE**			

Day 3 Thursday, 13 May 1993

	STREAM 1 ***Telecommunications — The Human Dimension***	***STREAM 2*** ***Telecommunications R&D in Australia***	***WORKSHOP 9***	***WORKSHOP 10***
0900	**CWU — Brave New World** Alf Foster, National Secretary	**Industry R&D Board** David Watson, DITAC	**Managing Your Private Network** Ted Sandemann	**Communications Management: Best Practice** Brian White/David Swift, Amos Aked Swift (A Repeat Presentation of Workshop 1)
0930	**The Emerging Role of the IT Manager** Shell, to be provided	**Advances in Speech Recognition** R. King, Dept of Electrical Engineering, University of Sydney		
1000	**From The Outside Looking In — Public Perceptions of the Carriers** Ann Cooper-Southam	**Development of a Multi-Media System** Telecom Research Laboratories		
1030	**MORNING BREAK**			
	STREAM 1 ***Privacy and Security in Communications***	***STREAM 2*** ***Modern Network Management***	***STREAM 3*** ***The Satellite Scene***	***WORKSHOP 10***
1100	**Privacy and the Law** Allan Collier, Sly & Weigall	**The Optus OSS** DEC, to be provided	**The Optus B1/B2 Satellites** Wayne Nowland, Optus	**Hands-on Spread Spectrum for LANS and WANS** Gavin Dyer, Datamatic

1130	**OSI and Data Security** Jane Clark, University of Queensland	**Voice/Data Network Management in the Real World — A Survey** Owen Richards, ATUG	**Next Generation Satellites** Hughes, to be provided	
1200	**How Secure is Your PC?** Michael Parkenson, CSIRO	**Managing the Diverse Network** Tony Kelly, SDI	**Telephone in the Sky** Adrian Coote, BT	
1230	**LUNCH BREAK**			
1400	**FINAL PLENARY SESSION** The Battle of the Carriers — A television program special recording on the pre-selection debate.			
1600	**CLOSE**			



WORKSHOP

Managing Customer & Supplier Relationships

ATUG is conducting a series of three workshops as a member service to improve the business skills of communications professionals in the new competitive environment.

The second workshop, titled 'Managing Customer and Supplier Relationships,' to be held in March 1993 in the seven capital cities, will cover the development of effective account skills, the management of relationships with suppliers and customers, and the business issues faced by functional managers.

The facilitator will be a Director of Focus Communications Pty Ltd, Tim O'Sullivan.

"Communications managers and their staff today find themselves managing complex 'buyer/seller' relationships involving their internal customers and external suppliers. In many cases, this proves to be an uncomfortable relationship as each side works towards achieving its business objectives in association with the 'technology manager.' Senior communications managers, thus often face a situation where their technology oriented personnel lack the business skills to effectively manage the customer/supplier relationship in a manner in which both the customer's and supplier's business needs are satisfied."

— Focus Communications Pty Ltd's Director, Tim O'Sullivan

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February

15-16 **EIS: Information Delivery for Quality and Service**, Marriott Hotel, Sydney. This conference will look at the information and skills needed to implement an Executive Information System to track non-financial performance. Organisations including Dulux, Prospect Electricity, Tubemakers, Credit Union Services, Carlton & United Breweries and the NSW Police Service will deliver case studies on their use of an EIS. International user, Walter Dempsey, Manager, Business Management, Commercial Engine Business, Pratt & Whitney (US) will explain how its customer-focused EIS transformed the way the company did business. This conference is also being held at the Parkroyal Hotel, Melbourne 18-19 February. Fee: $1,195. Enquiries — AIC Tel: (02) 235 1700 Fax: (02) 223 8216.

16-17 **The 1993 Pan European Digital Cellular Radio Conference,** The FIL Congress Centre, Lisbon, Portugal. This seventh conference titled 'GSM Under the Spotlight — Focussing on the Users' will feature real life commercial GSM networks in place instead of trials, plans and promises. Emphasis is being placed on the users and objectives of the conference include: Examining the progress made in the manufacture and type-approval of GSM equipment and in the deployment of GSM networks in Western Europe; Identifying the critical issues for the success of GSM including the likely impact of competing systems; and Examining the plans and prospects for GSM networks outside Western Europe. Enquiries — Tania Starley, IBC Technical Services. Tel: +44 71 637 4383 Fax: +44 71 631 3214.

17-19 **2nd Australian Conference on Telecommunications Software, (ACTS '93)**, Wollongong University, Wollongong. ACTS '93 will provide an opportunity for professionals in telecommunications and related industries to take an in-depth look at new opportunities for the development of telecommunications software. Australia leads the way in advanced ISDN and Intelligent Network services and new technology and new government policies will encourage the innovation of new services in telecommunications networks. The conference is aimed at users and providers of telecommunications and information services, telecommunications professionals, academics, planners and consultants. Enquiries — The Institute of Radio and Electronics Engineers Australia. Tel: (02) 327 4822 Fax: (02) 362 3229.

18-19 **High Speed Networks**, IIR Technology Centre, Sydney. This two day seminar will evaluate the switching technologies of the 90's including frame relay, cell relay, B-ISDN, ATM, SDH, SMDS, DQDB, MANs and WANs. Issues that will be discussed include: What are the new networking technologies? How do they fit together? What benefits will they give you? What are the pros and cons of each technology? and What are the key vendors offering? This seminar will also be held in Melbourne, 14-15 June (Venue to be advised). Fee: $1,195 Enquiries — IIR (02) 959 5455 Fax: (02) 959 4687.

22-23 **Corporate and Government Customer Impact of Telecommunications Network Competition**, the Sheraton-Wentworth Hotel, Sydney. At this conference delegates will hear Telecom, Optus and AAP discuss their strategies for 1993. Key issues include: Quality, reliability and accessibility of telecommunications services; a practical analysis of the choices available under competition; securing customer support and maintenance; assessing the pros and cons of outsourcing; and how to negotiate the best competitive tariff, service, billing and pricing deals. There will be two international guest speakers: Arthur Slotkin, Vice President and General Manager Systems Support Operations, Unisys (US); and David Patten, General Manager Sales & Marketing, Clear Communications, (NZ). Fee: $1,295. Enquiries — IIR Tel: (02) 954 5844 Fax: (02) 959 4684.

22-25 **Intercomm '93**, Vancouver Trade & Convention Center, Vancouver, Canada. This Global Telecommunications Congress and Exhibition has the theme 'Global Communications for the 21st Century.' This conference boasts over 400 trade booths and over 1,000 delegates — over 7,000 exhibition visitors are expected. Enquiries — Helen Rowell, Canadian Consulate. Tel: (03) 654 1433 Fax: (03) 650 5939.

March

3-5 **The Pan-Asian GSM Summit**, Marriott Hotel, Hong Kong. Highlights of this Global Systems for Mobile Communications conference are: Problems and solutions for GSM coordination in Pan-Asia, Government policy, regulation and licensing for GSM, Commercial opportunities in GSM, Comprehensive analysis of GSM billing and account transfer, and How to get your products approved and marketed into Asia. An optional third day will focus on GSM technology, there will be presentations from seven European Telecommunications Standards Institute/Special Mobile Group (ETSI/SMG) Chairmen. Fee: All three days $US1,795. Two days $US1,295. Day three only $US895. Enquiries — IIR Tel: (02) 954 5844 Fax: (02) 959 4684.

8-9 **Mobiles 1993**, Golden Gate Park Plaza Hotel, Sydney. At this 4th annual conference, key decision makers from Asia, New Zealand and Australia will analyse mobile communications planning, regulation and opportunities in the Pan-Asian region. The latest developments in GSM, AMPs, and LEOs will be discussed and also competitive mobile services in Australia and spectrum allocation and management of Australia's mobile communications. This conference is specifically designed to study the latest advances, policies, deployment and views in digital mobile communications. Presentations will be made by key players from DOTAC and France Telecom and other organisations. Fee: $1,295. Enquiries — IIR Tel: (02) 954 5844 Fax: (02) 959 4684.

8-10 **Hands-on Internetworking**, IIR Technology Centre, Sydney. This three-day workshop teaches participants to integrate existing LAN resources into WANs; maximise WAN productivity with OSI, assess the latest LAN extension devices to determine which will best suit your LAN needs, and also to understand the internetworking standards which affect LAN/WAN capability. This course is also being held in Melbourne, March 22-24. Fee: $1,695. Enquiries — IIR Tel: (02) 959 5455 Fax: (02) 959 4687.

18-19 **New Technologies & New Standards for IT Security**, The Pavilion Hotel, Canberra. This briefing for government and industry will feature key topics including Open Systems Security, Multi-platform LAN and PC Security, Information Privacy, EFTPOS, Impact of ICAC, and new 1993 World Security Standards. The international guest speaker is Charles Brookson, Head, Group Commercial Security Policy Unit, British Telecom. In addition, there will be practical presentations from organisations including Department of Defence, Federal Justice Office, ATO, Mobil Oil, Caltex Oil, Department of Finance and Department of Social Security. Fee: $1,195. Enquiries — IIR Tel: (02) 954 5844 Fax: (02) 959 4684.

24-25 **Cabling Management & Reform**, Sheraton Wentworth, Sydney. This event features Austel's new standards on Building Cabling Regulations and will look at current technologies and future trends. Also the latest international Standards Requirements for cables and connectors. Four speakers from US companies: Krone, Cresendo, ModTap and Motorola will speak on technology and trends. There will also be four case studies presented. Fee: $1,195. Enquiries — AIC Tel: (02) 235 1700 Fax: (02) 223 8216.

24-26 **4th International Congress of EDI Users**, Conrad International Hotel and Jupiters Casino, Gold Coast, Queensland. Presented by the EDI Council of Australia, the central theme for the conference is 'Doing EDI, not talking EDI' and the aim is to address both the real and imagined reasons to overcome the current barriers to implementation. EDI is not complicated — it is the changes in business practices that cause the complications. Organisations need to develop their own EDI strategy and implementation plans, and they must establish links across their entire business pipeline. Enquiries — EDI Council of Australia. Tel: (03) 819 6860 Fax: (03) 818 3129.

April

19-22 **SuperComm '93**, Georgia World Congress Centre, Atlanta, Georgia, US. Presented by the United States Telephone Association (USTA) and the Telecommunications Industry Association (TIA), SuperComm '93 is the largest annual telecommunications event in the world. This year SuperComm '93 has been designated as a Foreign Buyer Show by the US Department of Commerce. The US & Foreign Commercial Service at the American Consulate General in Melbourne plan to lead an Australian Foreign Buyer delegation to SuperComm '93. Enquiries — Lois Logan, American Consulate General, Melbourne. Tel: (03) 526 5927 Fax: (03) 510 4660.

28-30 **Hands-on Ethernet**, IIR Technology Centre, Sydney. Participants will build a live Ethernet network, while learning key techniques for installing, operating and troubleshooting Ethernet networks. After attending the course participants will be able to grasp the fundamentals of networks, optimise Ethernet performance and deal with cabling, security and diagnostic tools. Fee: $1,495 Enquiries — IIR Tel: (02) 959 5455 Fax: (02) 959 4687.

May

10-13 **The 4th Joint European Networking Conference (JENC)**, Trondheim, Norway. Organised by RARE (Reseaux Associés pour la Recherche Européenne) and in association with other groups including the Internet Architecture Board and the Internet Society, this year's Joint European Networking Conference has the theme 'European Networking in a Global Context.' It aims to explore the steps regarding the fact that networks covering a specific geographical area or networks for a specific user group will only be successful if connected to the rest of the world. Enquiries — RARE Tel: +31 20 639 1131 Fax: +31 20 639 3289.

17-22 **Asia Telecom'93**, World Trade Centre, Singapore. As part of its four year schedule of events, the International Telecommunication Union (ITU) is presenting Asia Telecom 93 to provide a platform for the exchange of information for technological advancements, and technical, policy, economic and regulatory developments. The Asia region is the world's fastest-growing telecommunications market — there's space for 300 million more lines and for up to $US1,000 billion in investments in the next 50 years. The four Symposia of the Asia Telecom 93 Forum Policy, Technical, Regulatory and Economic is attracting the most influential players in national and international telecommunications. Enquiries — Suzan Hee-Sook Lee, Project Manager, Asia Telecom 93. Tel: +41 22 915 5811 Fax: +41 22 740 1013.

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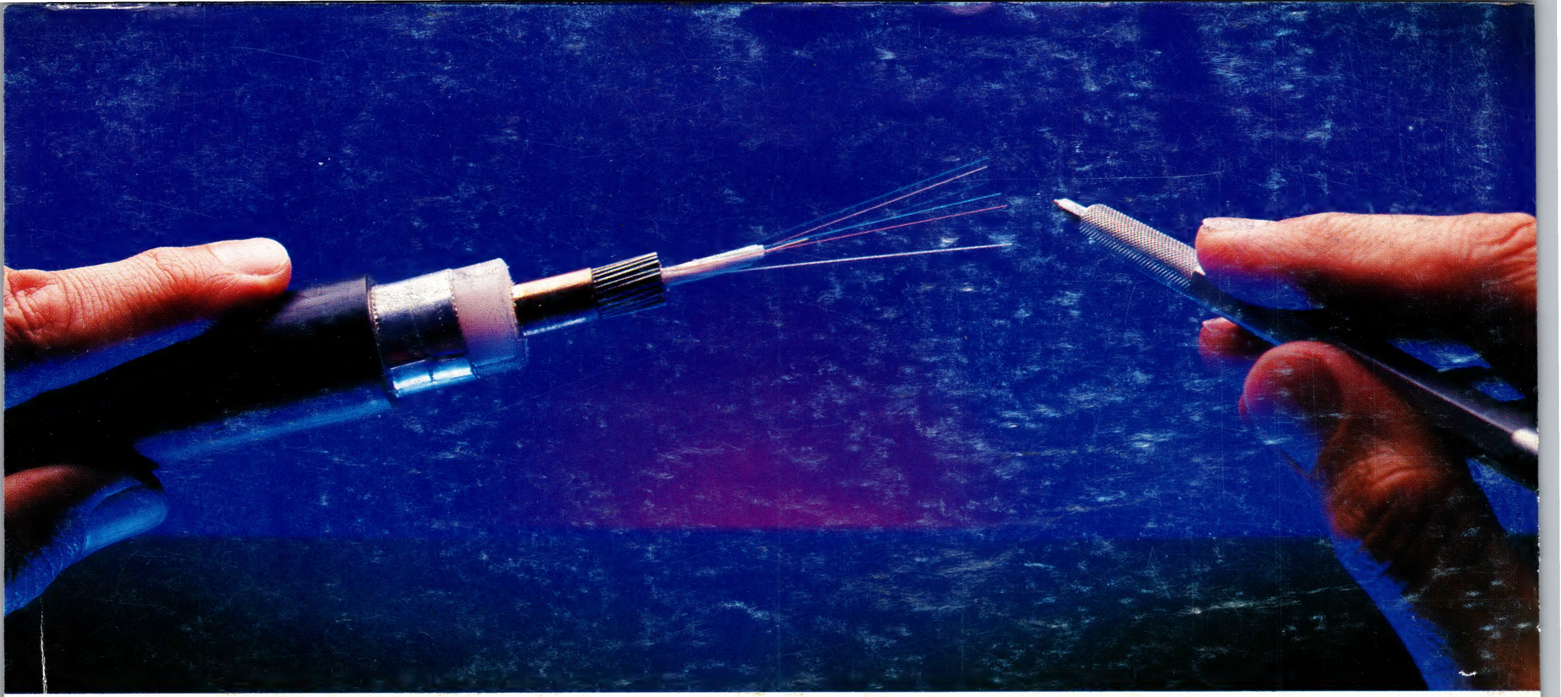

Just one of these fibres can carry 30,000 telephone calls between Australia and New Zealand.

This is optical fibre cable. It's manufactured by Alcatel in Australia, and it will carry up to 100,000 telephone calls, simultaneously, between Australia and New Zealand.

In fact, Alcatel has recently completed the laying of a cable like this, 2,200 kilometres across the floor of the Tasman Sea.

But that's only the first stage. Because Alcatel is now in the process of manufacturing another optical fibre cable that will stretch across the Pacific and link with the West Coast of the USA.

Which means that as well as a new era in communications, Australia has also established an exciting, high technology, multi-million dollar industry.

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